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FOOD TECHNOLOGY ABSTRACTS

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FOOD TECHNOLOGY ABSTRACTS

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ABBREVIATIONS

A	ampere
AAS	atomic absorption spectrometry
ADP	adenosine diphosphate
Anon.	Anonymous
AOAC	Association of Official Analytical Chemists
approx.	approximately
atm	atmosphere
ATP	adenosine triphosphate
a_w	water activity
BHA	butylated hydroxyanisole
BHT	butylated hydroxytoluene
b.p.	boiling point
Btu	British thermal unit
c-	centi- [as in cm, cm^2, cm^3]
cal	calorie
cd	candela
°C	degree centigrade
Ci	curie
CMC	carboxymethyl cellulose
coeff.	coefficient
conc.	concentrated
concn.	concentration
cv.	cultivar
cwt	hundredweight
d-	deci-
DE	dextrose equivalent
detn.	determination
DFD	dark firm dry
diam.	diameter
dil.	dilute
DM	dry matter
DNA	deoxyribonucleic acid(s)
dyn	dyne
E.	East, Eastern, etc
ECD.	electron capture detection
EDTA	ethylenediaminetetraaceti acid
Eh	oxidation-reduction potential
ELISA	enzyme-linked immunosorbent assay
f-	femto-[10^{-15}, as in fCi]
°F	degree Fahrenheit
FAO	Food and Agricultural Organization
FDA	Food and Drug Administration
FID	flame ionization detection
fl oz	fluid ounce
f.p.	freezing point
ft	foot, feet
g	gram
GC	gas chromatography
gr	gravity
gal	gallon
gf	gram-force
GLC	gas-liquid chromatography
h	hour
ha	hectare
HDPE	high density polyethylene
hl	hectolitre [100 l]
hp	horse power
HPLC	high performance/pressure liquid chromatography
HTST	high temperature short time
Hz	hertz [frequency cycles/s]
in	inch
IR	infrared
IU	international unit
J	joule
k-	kilo- [as in kcalk, kg]
K	Kelvin
l	litre
lb	pound
lbf	pound-force
LDPE	low density polyethylene
m-	milli- [as in mg, ml, mm]
m-	equivmilli-equivalent
M	molar concentration
M-	mega- [as in Mrad]
max.	maximum
min	minute [time]
min.	minimum
mol	mole
mol.wt.	molecular weight
m.p.	melting point
MPN	most probable number
MS	mass-spectrometry
n-	nano-[10^{-9}, as in nm]
N	Newton [kg m/s^2]
N.	North, Northern, etc
N	Normal concentration
NMR	nuclear magnetic resonance
NPU	net protein utilization
oz	ounce
p-	pico- [10^{-12}, as in pCi]
P	Poise
p	probability
Pa	pascal (N/M^2)
PAGE	polyacrylamide gel electrophoresis
PER	protein efficiency ratio
p.p.b.	parts per billion
p.p.m.	parts per million
PSE	pale soft exudative
PTFE	polytetrafluorethylene
PVC	polyvinyl chloride
PVDC	polyvinylidene chloride
qt	quart
R	rontgen
rad	rad or radian
ref.	reference(s)
rev/min	revolutions per minute
RH	relative humidity
RNA	ribonucleic acid(s)
S.	South, Southern, etc.
s.d.	standard deviation
SDS	sodium dodecylsulphate
s.e.	standard error
s	second [time]
SNF	solids-not-fat
sp., spp.	species
sp.gr.	specific gravity
summ.	summary
Suppl.	Supplement
t	metric tonne
temp.	temperature
TLC	thin layer chromatography
TS	total solids
UHT	ultra-high temperature
UV	ultraviolet
V	volt
var.	variety
vol.	volume
v/v	volume/volume
W	watt
W.	West, Western, etc.
WHO	World Health Organization
w/v	weight/volume
wk	week
wt.	weight
yd	yard
yr	year
μ	micro–[as in g, μm]
%	per centum
>	greater than
≥	greater than or equal to; not less than
<	less than
≤	less than or equal to; not greater than

ABBREVIATIONS FOR LANGUAGES

Language of text	
Dutch	Nl
French	Fr
German	De
Italian	It
Japanese	Ja
Norwegian	No
Spanish	E
Swedish	Sv

2050

Torreggiani (D). **Osmotic dehydration in fruit and vegetable processing.** *Food Research International* 26 (1); 1993; 59-68

The basic principles which control osmotic dehydration of fruit and vegetables are reported together with the most important parameters and their influence on the process. Effects of osmosis as a pre-treatment, mainly related to the improvement of nutritional, sensorial and functional properties of the products, are analysed. The distinctive aspect of this process, when compared to other dehydration methods, is the 'direct formulation' achievable through the selective incorporation of solutes, without modifying the food integrity. By balancing the 2 main osmotic effects, water loss and soluble solids uptake, the functional properties of fruit and vegetables could be adapted to many different food systems. Present applications of the process are shown and problems related to a further industrial development are analysed. AA

2051

Shimoda (M), Ishikawa (J), Kawano (T) and Osajima (Y). **Extraction of volatile compounds from aqueous solution using micro bubble, gaseous, supercritical and liquid carbon dioxide.** *Journal of Food Science* 59(1); 1994; 231-233

When separating volatile compounds from aqueous solution using supercritical CO_2 (SC CO_2), methods to bring SC CO_2 into contact with volatile compounds in the solution are very important. An extraction using micro bubble, gaseous, supercritical and liquid CO_2 generated by a filter nozzle was carried out. Under optimal conditions (20 MPa, 35°C), > 95% of volatile compounds consisting of 6-12 C atoms could be removed by extraction for 40 min at CO_2 flow rate of 4.0 g/min. Extraction at 35°C could achieve either a selective or nonselective separation by adjusting the extraction pressure, since the effect of pressure on extraction ratio was most significant at 35°C. AA

2052

Tice (PA). **Testing polymeric coatings on metal and paper substrates.** *Food Additives Contamination* 11(2); 1994; 187-196

The predicted migration test requirements for food and beverage cans with internal lacquer coatings and plastics paperboard composites against future European community legislation are described. GS

2053

Castle (L), Honeybone (CA), Jickells (SN), Philo (MR) and Sharman (M). **Practical aspects of testing food contact materials for migration.** *Food Additives Contamination* 11(2); 1994; 177-185

A simple migration test is reported to indicate whether or not a food makes contact with plastics. GS

2054

De Kruijf (N) and Rijk (R). **Test methods to simulate high-temperature exposure.** *Food Additives Contamination* 11(2); 1994; 197-220

The actual overall migration from packaging materials into food simulants during heating in a microwave oven, and the overall migration from these materials into food simulants applying time and temp. conditions stipulated in the current EC and Dutch legislation on food packaging are compared. GS

2055

Overton (BW). **Impact of recycling and environmental legislation.** *Food Additives Contamination* 11(2); 1994; 285-293

2056

Nielsen (TJ). **Limonene and myrcene sorption into refillable polyethylene terephtalate bottles, and washing effects on removal of sorbed compounds.** *Journal of Food Science* 59(1); 1994; 227-230

The sorption of 2 orange volatile compounds, myrcene and limonene, into refillable PET bottles, different types of PET strips and polycarbonate strips was studied. PET bottles were previously filled with orangeade and stored for 12 wk at 4 or 25°C. Bottles were washed with NaOH solutions [1.5 and 3.0%] and remaining aromas in the plastics were analysed. Sorption continued during the 12 wk of storage, but the major part was sorbed during the 1st wk. Bottles stored at 25°C absorbed considerably more myrcene and limonene than bottles stored at 4°C. A simulated industrial washing procedure removed small amounts of the aromas but 50-80% remained in the packaging material. Polycarbonate absorbed flavours to a much larger extent than did PET. AA

FOOD ENGINEERING AND EQUIPMENT

2057

Fakhouri (MO) and Ramaswamy (HS). **Temperature uniformity of microwave heated foods as influenced by product type and composition.** *Food Research International* 26 (2); 1993; 89-95

Temperature uniformity following microwave heating was studied with commercially refrigerated [sheperd's pie and lasagna bolognese] and frozen foods [lasagna and shepherd's pie], as well as with several food models formulated by incorporating different combinations of protein and fat into a starch gel. Commercially produced foods microwave-heated according to manufacturer's instructions generally showed large temp. nonuniformity with centre temp. < 70°C (except with frozen lasagna). Temp. uniformity could be improved by heating at lower power levels for longer periods. Product composition influenced heating rate and temp. uniformity in the food model, with added fat improving both. AA

2058

Dou (J), Toma (S) and Nakai (S). **Random-centroid optimization for food formulation.** *Food Research International* 26 (1); 1993; 27-37

Random-centroid optimization was modified by introducing a penalty function to accommodate constraints in formula optimization. Quality parameters not significantly different ($P > 0.05$) from those obtained by the Complex (constrained simplex) modified for formulation (Forplex) were computed by this new program and yielded similar ingredient compositions to those computed by Forplex. The new program was similar or more efficient in optimization than Forplex which occasionally stalled during searching for the optimum. It has been found that the new, multi-factor program written to accommodate up to 20 factors is appropriate for use in research and development, especially for formulations with constraints, while Forplex is recommended for routine formulation. AA

2059

Bouraoui (M), Richard (P) and Fichtali (J). **A review of moisture content determination in foods using microwave oven drying.** *Food Research International* 26 (1); 1993; 49-57

The paper reviews the use of microwave drying (MD) for food moisture content detn. Successful approaches for a variety of food products are summarized and their findings discussed. Results are compared with conventional techniques. Aspects considered include: Mechanisms of microwave heating and drying; Moisture detn. by MD; and Overview (high moisture fruits and vegetables, seeds and dry plant material, meat, dairy and processed foods). 52 references. BV

2060

Tong (CH), Lentz (RR) and Rossen (JL). **Dielectric properties of pea puree at 915 MHz and 2450 MHz as a function of temperature.** *Journal of Food Science* 59(1); 1994; 121-122, 134

Dielectric properties [dielectric constant (ε') and loss factor (ε'')] of 20% (w/w) pea puree with and without fortification of 35 mg thiamin/100 g pea puree at 915 MHz and 2450 MHz were measured from 25 to 125°C by the cavity perturbation technique. Thiamin did not affect dielectric properties at the concn. studied. The dielectric constant decreased as frequency and temp. increased. The loss factor increased as

temp. increased at 915 MHz. However, the relationship between loss factor and temp. was not direct at 2450 MHz due to the contributions of dipolar and ionic losses. AA

ENERGY IN FOOD PROCESSING

Nil

FOOD CHEMISTRY AND ANALYSIS

Chemistry

2061

Nagodawithana (T). **Flavour enhancers: Their probable mode of action.** *Food Technology* 48(4); 1994; 79-80, 82-85

The basic principles of taste perception and flavour potentiation, probable action of flavour enhancers on taste receptors in the absence and presence of flavour stimulus and the initiation of electrical signals caused by taste chemicals are dealt in this article. CSA

2062

Eromosele (IC) and Eromosele (CO). **Studies on the chemical composition and physico-chemical properties of seeds of some wild plants.** *Plant Foods for Human Nutrition* 43(3); 1993; 251-258

The seeds of fruits of 5 wild plants [*Lophira lanceolata*, *Sclerocarya birrea*, *Sterculia setigera*, *Detarium microcarpium* and *Blighia sapida*] were analysed to establish their proximate compositions and the physicochemical characteristics and the possibility of using the seeds or oils for human consumption was also investigated. Proximate values of protein, oil and carbohydrate contents of the seeds suggested that they may be adequate only for the formulation of animal feeds, subject to toxicity testing. Iodine values (IV) of the oils were < 88; saponification values were in the range 157-261 mg KOH. Storage properties of oil from *Lophira lanceolata* seed were studied over a period of 4 wk under conditions of light (ambient), darkness (ambient) and refrigeration. IV of the oil decreased in all cases but more so on exposure to light. In contrast, the peroxide value of the oil showed very little change under conditions of darkness and refrigeration over the same period but increased 7-fold for the photo-exposed oil. AA

Chemistry (Analytical)

2063

Bailey (PJ) and Rohrback (BG). **Applications of chemometrics in the food and beverage industry.** *Food Technology* 48(4); 1994; 69-72

Discusses the application of chemometrics in food and beverage industries which include process monitoring control, sensory evaluation, detn. of economic fraud and total quality commitment. CSA

2064

White (JP), Davidson (VJ) and Otten (L). **A capillary viscometer for characterization of fluid foods.** *Food Research International* 26 (2); 1993; 109-113

A multi-section capillary viscometer was designed and tested for measuring the rheological properties (e.g. power-law parameters, thixotropy) of food materials. The apparatus included a data acquisition system to collect flow rate, temp. and differential pressure measurements as inputs to a BASIC algorithm which computed estimates of the power-law parameters in real time. The apparatus was tested for steady-state and dynamic measurements, and an analysis of effects of measurement errors on parameter estimates was completed. Rheological properties of representative food materials (carboxymethylcellulose solutions, pregelatinized starch, locust bean gum) as well as systems with enzymes hydrolysing complex polysaccharides were characterized. AA

2065

Grikshtas (R) and Rao (MA). **Determination of slip velocities in a concentric cylinder viscometer with Mooney and Kiljanski methods.** *Journal of Texture Studies* 24(2); 1993; 173-184

Slip velocities of 19 tomato concentrates and 5 apple sauces at cup and bob of a concentric cylinder (CC) system were determined using 2 methods: the Kiljanski method using 2 CC systems, and the Mooney method using 3 CC systems. For most samples, there were large differences in magnitudes of slip velocities at the cup and bob calculated according to the 2 methods. However, corrected shear rates according to the 2 methods were in good agreement. Both the calculated slip coeff. of Mooney and the slip velocity of Kiljanski increased with applied shear stress according to power relationships; however, the former showed a weaker dependence on applied stress. AA

FOOD MICROBIOLOGY AND HYGIENE

Microorganisms

Bacteria

2066

Somers (EB), Schoeni (JL) and Wong (ACL). **Effect of trisodium phosphate on biofilm and planktonic cells of *Campylobacter jejuni*, *Escherichia coli* 0157:H7, *Listeria monocytogenes* and *Salmonella typhimurium*.** *International Journal of Food Microbiology* 22(4); 1994; 269-276

This study examines the efficacy of trisodium phosphate (TSP) against planktonic (suspended) and biofilm (attached) cells of *C. jejuni*, E. coli# 0157:H7, *L. monocytogenes* and *S. typhimurium* at room temp. (RT) and 10 C. At either temp. E. coli 0157:H7 was the most sensitive to TSP treatments; 106 cfu/ml of planktonic or 105 cfu/cm2 of biofilm cells were eliminated by 30s treatment with 1% TSP. C. jejuni was slightly less sensitive and *L. monocytogenes* was most resistant to TSP at 10 C. TSP was found to be effective in reducing bacterial populations on other food products besides raw poultry or on food and non-food contact surfaces. SRA

Bacillus stearothermophilus

2067

Hayakawa (I), Kanno (T), Yoshiyama (K) and Fujio (Y). **Oscillatory compared with continuous high pressure sterilization on Bacillus stearothermophilus spores.** *Journal of Food Science* 59(1); 1994; 164-167

To establish a sterilization method using minimal heating effects of high pressure on bacteriostasis were studied using thermoduric spores of *Bacillus stearothermophilus* [IFO 12550]. After exposure to 800 MPa for 60 min at 60°C, the spore count decreased from 10^6 to 10^2/ml. However, exposure to the same pressure at room temp. did not cause significant change in spore numbers. The synergistic effect of high pressurization on the bacteriostatic action of sucrose fatty acid ester at low concn. (< 10 p.p.m.) was pronounced with sucrose palmitic acid ester but not with sucrose stearic acid ester. Oscillatory pressurization was more effective for spore sterilization. 6 oscillation cycles of 5-min pressurization with 400 MPa at 70°C decreased the spore count from 10-6 to 10^2/ml; with 600 MPa complete sterilization was achieved. AA

Bacillus thermophilus

2068

Hayakawa (I), Kanno (T), Tomita (M) and Fujio (Y). **Application of high pressure for spore inactivation and protein denaturation.** *Journal of Food Science* 59(1); 1994; 159-163

Reports a study conducted to develop a method of sterilizing *Bacillus stearothermophilus* [IFO 12550] spores which cause a flat, sour taste in canned liquid coffee during heat sealing] with minimal heating. Inactivation was achieved by spore destruction through 6 cycles of oscillatory pressurization at 70°C and 600 MPa; inactivation was not complete within 60 min with continuous pressurization. 4 pressurization cycles at 600 MPa and 5 min/cycle decreased the spore count from 10^6 to 10^2/ml; 6 cycles decreased the count from 10^6 to < 10^0. Spore inactivation was dependent on adiabatic expansion velocity. Protein denaturation by high pressures was due to phase changes of water under high pressure and was not affected by adiabatic expansion velocity. AA

Clostridium sporogenes

2069

Ocio (MJ), Sanchez (T), Fernandez (PS), Rodrigo (M) and Martinez (A). **Thermal resistance characteristics of PA3679 in the temperature range of 110-121°C as affected by pH, type of acidulant and substrate.** *International Journal of Food Microbiology* 22(4); 1994; 239-247

The heat resistance of spores of *Clostridium sporogenes* PA3679 at 110 and 121 C in non-acidified and acidified mushroom extract was studied. Phosphate buffer, pH 7 was used as a reference medium to establish the inherent heat resistance of spores. Spores were less heat resistant in the non-acidified mushroom extract than in phosphate buffer. Acidification of the extract had an effect on D values which was dependent on the specific pH. At pH 6.22, D values were higher than those in non-acidified extract, for both type of acidulants, but the difference between D values in both substrates was affected by temp. The higher the temp., the less the difference. Acidification at other pH levels did not have a significant effect (P less than or equal to 0.05) on the D value at both temp. The Z value ranged from 9.79- 12/09°C for citric acid and from 8.18-10.18 C for glucono-δ–D-lactone. Z value increased with increase in pH for both acidulants. SRA

Lactobacillus

2070

Edwards (CG) and Peterson (JC). **Sorbent extraction and analysis of volatile metabolites synthesized by lactic acid bacteria in a synthetic medium.** *Journal of Food Science* 59(1); 1994; 192-196, 205

Volatile metabolites synthesized by strains of *Lactobacillus brevis*, *L. fructivorans*, *L. hilgardii*, *L. plantarum*, *Pediococcus parvulus* and *Leuconostoc oenos*, originally isolated from commercial wines were extracted from a synthetic medium using C18 sorbent cartridges and analysed using GLC. All organisms synthesized isoamyl alcohol, 1-hexanol, 3-(methylthio)-1-propanol and 2-phenyl ethanol in varying concn. Several other alcohols, acids, aldehydes and esters were produced or utilized by some species or strains and enabled differentiation of the organisms. Recoveries of metabolites were dependent on the compounds, matrix and presence of ethanol. AA

Listeria monocytogenes

2071

Mackey (BM), Boogard (E), Hayes (CM) and Baranyi (J). **Recovery of heat-injured *Listeria monocytogenes*.** *International Journal of Food Microbiology* 22(4); 1994; 227-237

The effect of temp. (5, 20-25°C) and composition of the recovery medium (blood agar) on growth of heat-injured *L. monocytogenes* was studied. Incubation of cells in broth or chicken slurry at 5°C did not repair of potentially lethal injury. In some cases incubation of heat-injured cells at 5°C resulted in death of a proportion of the population. Repair of sublethal heat-injury, measured as the time of incubation in tryptone soya broth needed to regain the ability to grow on *Listeria* selective agar, was slower and less complete at 25°C than at 2°C; repair took 10-15 h at 25°C compared with 8-12 days at 5 C. As a corollary, refrigeration of heat-treated foods should not therefore increase the risk that cells would recover from the heat treatment. SRA

2072

Szuprynski (CJ). **Host defense against *Listeria monocytogenes*: implications for food safety.** *Food Microbiology* 11(2); 1994; 131-147

The current status of research on the immunoregulation of resistance to *L. monocytogenes* infection is briefly reviewed. Aspects include, overview of the immune system, virulence mechanisms of *L. monocytogenes*, innate defense mechanisms against listeriosis, T cells in anti-*Listeria*-resistance, cytokines in anti-*Listeria* resistance host defense against gastrointestinal listeriosis, and implications for human health. 85 references. SRA

2073

Buchanan (RL), Golden (MH), Whiting (RC), Phillips (JG) and Smith (JL). **Non-thermal inactivation models for Listeria monocytogenes.** *Journal of Food Science* 59(1); 1994; 179-188

The effects of temp., lactic acid (or pH), NaCl and sodium nitrite on the non-thermal inactivation of a 3 strain mixture of *Listeria monocytogenes* [Scott A, HO-VJ-S and V-7] were examined in brain heart infusion broth. A total of 249 survivor curves representing 157 combinations of the 4 variables were generated. Survivor curves were described mathematically by fitting data using linear and nonlinear primary models. Supplemental studies demonstrated that: preculturing the microorganism in an acidic environment or in media containing glucose increased acid tolerance; survivor curve tailing was not due to the presence of a more resistant subpopulation; and the rate of non-thermal inactivation was independent of initial population density. Response surface models were developed for predicting the effects and interactions of the 4 independent variables on the inactivation of *L. monocytogenes* under adverse environmental conditions. AA

Fungi

Mushrooms

2074

Adewusi (SRA), Alofe (FV), Odeyemi (O), Afolabi (OA) and Oke (OL). **Studies on some edible wild mushrooms from Nigeria. I. Nutritional, teratogenic and toxic considerations.** *Plant Foods for Human Nutrition* 43(2); 1993; 115-121

The biological value of 5 edible mushrooms (*Chlorophyllum molybditis*, *Psathyrella atroumbonata*, *Termitomyces robustus*, *Termitomyces striatus* and *Volvariella esculenta* was determined using weanling rats. *C. molybditis* supported rapid growth with PER (2.63) higher than a casein control (2.50). *P. atroumbonata* was average in biological performance (PER 1.50) while *T. robustus* and *V. esculenta* did not support growth. Rats on *T. striatus* dried at 60°C for 48 h lost wt. rapidly and showed pathological signs of toxicity by the 2nd day. All rats on this diet died by the 4th day of the exp. When *T. striatus* dried at 90°C for about 8 h was fed, rats gained wt. marginally but all survived. Prolonged storage of *T. striatus* at 60°C for 5-8 wk also seemed to detoxify the poisonous component such that PER and net protein retention values were 0.8 and 2.0, respectively. 2 pairs each of adult rats fed *C. molybditis* and *Tricholoma lobayensis* diets for 10 days were mated. Rats of *C. molybditis* diet gave 5 and 6 litters each and only one of these litters seemed to have retarded growth. Rats on *T. lobayensis* diet did not produce any litters for 14 wk but the female produced offspring when mated with control male rats. AA

BIOTECHNOLOGY

2075

Ogrydziak (DM). **Yeast extracelleular proteases.** *CRC Critical Reviews in Biotechnology* 13 (1); 1993; 1-55

Yeast extracellular proteinases are reviewed. Aspects considered include: Yeast extracellular proteinase production (surveys, extracellular proteinase production by *Saccharomyces*); Regulation, purification and characterization (*Rhodotorula glutinis* K-24, *Cryptococcus albidus* var. *aerius*, *Candida albicans*, *Candida parapsilosis*, *Candida tropicalis*, *Yarrowia lipolytica*, *Candida olea*, *Saccharomyces fibuligera*, *Saccharomyces cerevisiae* BAR1, relatedness of yeast extracellular proteinases); Processing and secretion (*Saccharomyces cerevisiae* BAR1 proteinase, *Yarrowia lipolytica* alkaline extracellular proteinase, a common motif in yeast extracellular proteinase processing); Role of *Candida* acid proteinases in pathogenesis; Genetic engineering of secretion of proteinases from yeast (beer and wine haze reduction, secretion of carboxypeptidase Y by *Saccharomyces cerevisiae*, secretion of KEX2 proteinase by *Saccharomyces cerevisiae*, calf prochymosin in three different yeasts, *Mucor pusillus* acid proteinase in *Sacch. cerevisiae*, *Asp. oryzae* alkaline and neutral proteinases in *Sacch. cerevisiae*, *Asp. oryzae* alkaline proteinases in *Zygosacch. rouxii*, *Rhizopus niveus* aspartic proteinase in *Sacch. cerevisiae*, *Acremonium chrysogenum* (*Cephalosporium acremonium*)

alkaline proteinase in *Sacch. cerevisiae*, human immunodeficiency virus (HIV) proteinases secreted from *Sacch. cerevisiae*, tissue plasminogen activator in three different yeasts, porcine and human urokinase in *Saccharomyces cerevisiae*); and Secretion of heterologous proteins using sequences from yeast extracellular proteinase genes (*Sacch. cerevisiae* Bar proteinase, *Yarrowia lipolytica* alkaline extracellular proteinase, non-yeast extracellular proteinase gene secretion sequences used in yeast). 185 references. BV

2076

Doelle (HW), Kirk (L), Crittenden (R), Toh (H) and Doelle (MB). ***Zymomonas mobilis* - science and industrial application.** *CRC Critical Reviews in Biotechnology* 13 (1); 1993; 57-98

Scientific and industrial aspects of the *Zym. mobilis* are reviewed. Aspects covered include: Sucrose metabolism (sucrose hydrolysis, levan formation, fructo-oligosaccharide formation, regulation of by-product formation, industrial application of a *Zymomonas* ethanol technology (ethanol production, ethanol plus fructose production)); Glucose metabolism (anaerobic fermentation (substrate utilization, product inhibition, enzymes), aerobic respiration (growth and metabolism, electron transport), application of a starch-(glucose)-based *Zymomonas* ethanol technology into industry); Genetic modifications (improvement of substrate range (lactose, galactose, raffinose, starch, L-alanine), evolutionary approach, product formation (beta-carotene, acetaldehyde), gene transfers (*Zymomonas mobilis*, *Escherichia coli*, *Erwinia* and *Klebsiella*), vectors, recombination and sequencing); and Immobilization (whole cell immobilization (alginate, carrageenan, ion exchange resins, polyurethane foam, cell aggregation/flocculation, covalent coupling, passive immobilization), enzyme immobilization, coimmobilization, immobilized bioreactor design (fixed bed bioreactor, stirred tank reactor (STR), fluidized bed reactor (FBR)), biosensors). 362 references. BV

Spirulina

2077

Kapoor (R) and Mehta (U). **Utilization of β-carotene from Spirulina platensis by rats.** *Plant Foods for Human Nutrition* 43(1); 1993; 1-7

The availability of β-carotene from *Spirulina* [blue green algae-a potential food supplement] as compared to standard all trans β-carotene was studied by the liver and kidney vitamin A storage method. After 21 days of vitamin A depletion, rats were repleted with β-carotene from *Spirulina* and a standard source at 2 dietary levels (60 and 120 μg/day) for a 10 day period. At lower levels, liver storage levels of vitamin A and the % of β-carotene absorption were comparable to those of the standard. At higher levels both these parameters of the *Spirulina* fed group were significantly ($P < 0.01$) inferior to the standard source fed group. However, the *Spirulina* fed group showed better ($P < 0.05$) growth than the standard fed group did at both low and high levels of feeding. AA

TISSUE CULTURE

Nil

FOOD ADDITIVES

Stabilizers

Gums

2078

Tang (J), Lelievre (J), Tung (MA) and Zeng (Y). **Polymer and ion concentration effects of gellan gel strength and strain.** *Journal of Food Science* 59(1); 1994; 216-220

Failure stresses and strains were measured in compressive, tensile and torsional modes on gellan [gum] gels at 4 polymer (0.6-1.8% w/v) and 7 Ca^{++} (1.5-60mM) concn. Shear stresses at failure were equal in all 3 testing modes and proportional to gellan content. Low Ca gels increased linearly in strength with Ca^{++} concn. until it reached a level of approx. 0.5 Ca ions per repeat tetrasaccharide unit of gellan gum polymer. Gel strength decreased linearly with Ca^{++} at higher concn. Low Ca gels were

extensible with failure strains decreasing as the logarithm of Ca^{++}, whereas high Ca gels were brittle and failed at a constant strain, the value of which was twice as high in compression and torsion as in tension. AA

2079

Rosett (RT), Shirley (L), Schmidt (SJ) and Klein (BP). **Na^+ binding as measured by -2-3Na nuclear magnetic resonance spectroscopy influences the perception of saltiness in gum solutions.** *Journal of Food Science* 59(1); 1994; 206-210

Binding of Na^+ in aqueous gum systems, as determined by -2-3Na NMR spectroscopy, and its relations to perceived saltiness [determined by multidimensional scaling techniques] were examined. 2 levels of NaCl (0.1% and 0.2%) were added to 2 concn. (0.1% and 0.3%) of 2 ionic (xanthan and kappa carrageenan) and 2 non-ionic (locust bean and guar) gum solutions. Saltiness perception was affected by the ionic properties of the gums. NMR transverse relaxation rates (R_2, sec^{-1}) indicated Na^+ was less mobile in ionic than non-ionic systems. Ionic gums correspondingly suppressed saltiness perception compared to non-ionic gums. As Na^+ increased in both ionic and non-ionic systems, R_2 values converged and perceived saltiness equalized. Food components that bind Na^+ may suppress saltiness perception, which may be important in low-Na foods. AA

CEREALS

2080

Jood (S), Kapoor (AC) and Ram Singh. **Available carbohydrates of cereal grains as affected by storage and insect infestation.** *Plant Foods for Human Nutrition* 43(1); 1993; 45-54

Total soluble sugar, reducing sugar, non-reducing sugar and starch contents of wheat, maize and sorghum grains were affected adversely at 25, 50 and 75% insect infestation caused by *Trogoderma granarium* Everts and *Rhizopertha dominica* Fabricius, separately and mixed population. *R. dominica* caused significant ($P < 0.05$) reduction in available carbohydrates at 50 and 75% infestation levels whereas *T. granarium* achieved a similar effect at 75%. Mixture of both insect spp. caused intermediate losses. Storage of cereal grains up to 4 months resulted in substantial increases in sugars and decreases in starch content, but storage for a shorter period of time did not cause any significant changes in level of carbohydrates. AA

Rice

2081

Perez (CM), Juliano (BO), Bourne (MC) and Morales (AA). **Hardness of cooked milled rice by instrumental and sensory methods.** *Journal of Texture Studies* 24(1); 1993; 81-94

Fifteen milled rice var. with amylose contents in the range 1.4-28.6% and different cooked rice hardness values were used to verify the sensitivity of the present objective method for measuring cooked rice hardness. The grains were cooked either in a rice cooker using a fixed water:rice ratio of 2:1 or by boiling in excess water for the predetermined optimum cooking time for each sample followed by draining. Hardness of cooked rice was measured in an Instron Universal Testing Machine using 2 methods: (1) puncture of 100 individual grains and (2) extrusion through a 30 cm^2 Ottawa Texture Measuring System cell with either a 3.2- or 4.8-mm-diam. holes plate. Hardness values were compared with sensory scores. Sensory hardness of the rices cooked in a fixed amount of water showed good correlation with puncture force ($r = 0.94$, $P < 0.01$) and with extrusion force through a 3.2-mm-diam. holes plate ($r = 0.94$). The correlation coeff. between puncture force and extrusion force was 0.97. Paired comparison test by the sensory panel on 3 pairs of rices verified consumers' claims with respect to preference between members of each pair and agreed with results of ranking tests. AA

2082

Eggum (BO), Cabrera (MIZ) and Juliano (BO). **Protein and lysine digestibility and protein quality of cooked Filipino rice diets and milled rice in growing rats.** *Plant Foods for Human Nutrition* 43(2); 1993; 163-170

Barley

2083

Wang (L), Newman (RK), Newman (CW), Jackson (LL) and Hofer (PJ). **Tocotrienol and fatty acid composition of barley oil and their effects on lipid metabolism.** *Plant Foods for Human Nutrition* 43(1); 1993; 9-17

Barley oil was extracted with hexane from the grain of a high oil waxy hull-less barley. 12 male broiler chicks were fed corn-based diets with either 10% barley oil, 10% corn oil or 10% margarine ad libitum for 10 days. Total plasma cholesterol (TC) concn. of the chicks fed barley oil was 34% lower ($P < 0.05$) than that of the chicks fed margarine. Plasma low density lipoprotein cholesterol (LDLC) concn. of chicks fed barley oil was 53% and 59% lower ($P < 0.05$) than those of chicks fed corn oil and margarine, respectively. Plasma high density lipoprotein cholesterol (HDLC) and triglyceride concn. of the barley oil group were similar to those of the margarine but higher ($P < 0.05$) than those of the corn oil group. Chicks fed the barley oil gained more ($P < 0.05$) body wt. than those fed the corn oil and margarine. Barley oil had an effect in suppression of TC and LDLC in chicks compared to margarine. Barley oil suppressed LDLC but not HDLC in chicks compared to corn oil. A greater wt. gain of the chicks fed barley oil suggested that these chicks had normally functioning digestion and absorption. α-Tocotrienol and γ-tocotrienol content of the barley oil were 24 and 17 times greater, respectively, than those observed in the corn oil, while the same fractions were not detectable in the margarine. Polyunsaturated fatty acid content of barley oil was more than 3-fold that of margarine. Data suggest that α-tocotrienol and polyunsaturated fatty acids are hypocholesterolaemic components in barley oil. AA

Corn

2084

Yam (KL), Gogoi (BK), Karwe (MV) and Wang (SS). **Shear conversion of corn meal by reverse screw elements during twin-screw extrusion at low temperatures.** *Journal of Food Science* 59(1); 1994; 113-114

Corn flour was extruded in a twin-screw extruder to study effects of 1 and 2 reverse-screw elements on conversion at extrusion temp. < 60°C. Significant conversion was observed across the reverse-screw elements. The conversion was due to shear alone, since the thermal effect was negligible at these low temp. Encompassing the reverse-screw elements were 4 visually distinct zones characterized by the state of the material. AA

2085

Bhattacharya (M), Padmanabhan (M) and Seethamraju (K). **Uniaxial extensional viscosity during extrusion cooking from entrance pressure drop method.** *Journal of Food Science* 59(1); 1994; 221-226, 230

Uniaxial extensional viscosity (UEV) of corn meal flour (CMF) at moisture contents of 30 and 35% (dry wt. basis) and temp. of 160 and 180°C was estimated from entrance pressure drop measurements during extrusion cooking. The value of the shear component of the entrance pressure drop was an order of magnitude below that of the extensional component. CMF exhibited shear thinning and extension thinning behaviour during the processing conditions used. Increasing moisture and temp. decreased extensional viscosity at higher extension rates [($> 50\ s^{-1}$). Both Gibson's and Cogswell's analyses gave similar values for UEV]. The Trouton ratio ranged from 25 to 50 and was affected by product moisture content, barrel temp. and deformation rate. AA

2086

Yu (BH) and Kies (C). **Niacin, thiamin, and pantothenic acid bioavailability to humans from maize bran as affected by milling and particle size.** *Plant Foods for Human Nutrition* 43(1); 1993; 87-95

The study reports the bioavailability of selected B vitamins (niacin, pantothenic acid and thiamin) to humans from wet and dry milled maize brans which were coarsely or finely ground. Using a double cross-over design, 9 subjects were fed laboratory controlled diets

containing unsupplemented bread or bread supplemented with finely ground, wet milled maize bran; coarsely ground, wet milled maize bran; finely ground, dry milled corn bran; or coarsely ground, dry milled maize bran. Urine samples were analysed for contents of the test vitamins. Although varying somewhat among vitamins, in general, better apparent bioavailability was achieved with the finely ground, dry milled maize bran than with the other test brans. BV

Finger millets

2087

Barbeau (WE) and Hilu (KW). **Protein, calcium, iron, and amino acid content of selected wild and domesticated cultivars of finger millet.** *Plant Foods for Human Nutrition* 43(2); 1993; 97-104

Two wild and 8 domesticated cv. of finger millet were analysed to determine their proximate composition and Ca, Fe and amino acid content. Wide variations were observed in the protein (mean values ranged from 7.5 to 11.7%), Ca (376 to 515 mg/100 g) and Fe (3.7 to 6.8 mg/100 g) content of the wild and domesticated cv. A wild progenitor of finger millet, *Eleusine coracana* subsp. *africana* was significantly higher in protein than 4 of the 6 domesticated accessions analysed. The Ca and Fe content of the wild progenitor was also significantly > that of 2 domesticated cv. The wild sp. was also higher in lysine and 5 other essential amino acids. Results indicate that the nutritional value of finger millet may be significantly improved by selective crossbreeding of the cereal's wild and domesticated cv. AA

Sorghum

2088

Jood (S), Kapoor (AC) and Singh (R). **Biological evaluation of protein quality of sorghum as affected by insect infestation.** *Plant Foods for Human Nutrition* 43(2); 1993; 105-114

Protein quality of sorghum grains having 25, 50 and 75% infestation caused by a mixed population of *Trogoderma granarium* Everts and *Rhizopertha dominica* Fabricius was biologically evaluated by rat growth and nitrogen balance studies. Feeding a diet containing insect infested sorghum grains (50 and 75%) resulted in marked decrease in food intake, protein intake, gain in body wt., food efficiency ratio, PER, N consumption, N absorption, biological value, NPU, DM digestibility, NPR and protein retention efficiency. These parameters showed a negative association with insect infestation levels. However, 25% level of grain infestation did not affect these parameters significantly. AA

PULSES

2089

Hoppner (K) and Lampi (B). **Folate retention in dried legumes after different methods of meal preparation.** *Food Research International* 26 (1); 1993; 45-48

Twenty-five different samples of legumes were analysed for total folate. A composite sample of each legume was prepared and assigned to usual cooking time categories (20, 90 and 150 min). Within each cooking time category, legumes were pretreated with: a quick soak (brought to a boil and held for 2 min, covered and left to soak for 1 h) and a long soak method (soaked in water for 16 h). Average folate retention in legumes cooked for 20 and 90 min differed significantly (P less than or equal to 0.05). The mean retention for folate in legumes in the 20 min cooking category was 60% without presoak, 18% for quick soak vs. 35% for long soak, and for the 90 min cooking category was 31% for quick soak vs. 42% for long soak. There was no significant difference (P > 0.05) in folate retention between quick (41%) and long soak (44%) pretreatment for legumes in the 150 min cooking category. Results indicate that presoaking can affect folate retention in meal prepared from legumes. AA

2090

Rheinhard (DW), Gujska (E) and Khan (K). **Reduction of stachyose in legume flours by lactic acid bacteria.** *Journal of Food Science* 59(1); 1994; 115-117

Changes in stachyose content and bacterial counts during incubation with 2.5, 5 and 10% *L. plantarum* or *L. fermentum* to pinto bean and fried peas flour were compared. Amount of stachyose and number of lactobacilli were determined after 24, 48 and 72 h. After 72 h incubation stachyose was reduced in pinto bean (by 27%) and field pea (43%) flours. Duration of incubation was the only factor which influenced stachyose reduction. Amount of inoculum and type of bacteria were of minor importance. Number of bacteria decreased significantly during incubation. AA

2091

George (AA), de Lumen (BO), Whitaker (JR) and Sgarbieri (VC). **Methionine-containing proteins in two *Phaseolus vulgaris* cultivars with different methionine bioavailabilities.** *Plant Foods for Human Nutrition* 43(3); 1993; 225-232

Full utilization of legumes as human food is limited by a deficiency of sulphur amino acids, low protein digestibility, low methionine bioavailability and the presence of antinutritional factors. A new cv. of *Phaseolus vulgaris* (Carioca 80) is described which has 56.8% available methionine, compared with 29.3% availability in the parent cv. Carioca. Total methionine content, denaturing gel electrophoretic patterns of methionine-containing proteins, and the % of phaseolins (the major storage proteins in Phaseolus) relative to the total protein are similar in the 2 cv. Although the digestibility of the 2 cv. is similar, the increased biological value of Carioca 80 may indicate that there are differences in overall bean composition that affect protein hydrolysis and utilization. It is suggested that this is due to differences in the distribution of methionine in the methionine-containing protein of the 2 cv. AA

2092

Ayyagari (R), Raghunath (M) and Narasinga Rao (BS). **Early effects and the possible mechanism of the effect of concanavalin A (Con A) and *Phaseolus vulgaris* lectin (PHA-P) on intestinal absorption of calcium and sucrose.** *Plant Foods for Human Nutrition* 43(1); 1993; 63-70

Food lectins are known to affect the absorption of nutrients in experimental animals and altered morphology of the intestinal mucosa due to prolonged feeding of lectins is suggested to be the cause. However, toxic symptoms appear in humans immediately after consumption of lectin rich foods and the mechanism of this immediate action is not known. This study reports the immediate effect of concanavalin A (Con A) and *Phaseolus vulgaris* lectin (PHA-P) on the absorption of Ca^{2+} and sucrose in rat intestine and the possible role of lectin-membrane interactions in the process. Ca^{2+} absorption was lowered by Con A, due to Con A interacting with the intestinal mucosal membrane. Sucrose absorption was also altered, probably due to Con A binding the intestinal mucosal membrane. PHA-P did not have any effect on either sucrose or Ca^{2+} absorption. Results indicate that the effect on intestinal nutrient absorption depends on the type of lectin used (and its concn.) as well as the type of nutrient, besides the duration of exposure of intestinal mucosa to the lectin. AA

Beans

2093

Li (Z), Alli (I) and Kermasha (S). **In-vitro α-amylase inhibitor activity-phytate relationships in proteins from *Phaseolus* beans.** *Food Research International* 26 (3); 1993; 195-201

Citric acid extracted, crystalline proteins and alkali extracted non-crystalline proteins from 4 types of *Phaseolus* beans were investigated for α-amylase inhibitory activity. Influence of phytate on α-amylase inhibitory activity was also studied. Inhibitory activities of non-crystalline proteins were higher than those of crystalline proteins. All proteins showed α-amylase inhibitory activity and contained phytate which correlated statistically ($r = 0.68$, P less than or equal to 0.01) with α-amylase inhibitory activity. Free phytate did not inhibit α-amylase activity; however, phytate in combination with protein was inhibitory. The observed α-amylase inhibition of bean proteins could be due to the presence of proteinaceous α-amylase inhibitor and/or a phytate protein complex with high inhibitory activity. AA

Haricot beans

2094

Key (FB) and Mathers (JC). **Complex carbohydrate digestion and large bowel fermentation in rats given wholemeal bread and cooked haricot beans (*Phaseolus vulgaris*) fed in mixed diets.** *British Journal of Nutrition* 69 (2); 1993; 497-509

The digestion of non-starch polysaccharides (NSP) and of resistant starch (RS) by rats fed on wholemeal bread based diets containing 0-450 g cooked, freeze-dried haricot beans (*P. vulgaris*)/kg diet was measured over the final 14 days of a 21 day feeding experiment. Bread and beans provided all the dietary polysaccharide. RS could not be detected consistently in faeces and it was assumed that this fraction was entirely fermented in the large bowel. NSP digestibilities were 0.56 and 0.86 for wholemeal bread and beans, respectively, with no evidence that the dietary presence of beans affected digestibility of bread NSP. Bean non-cellulosic polysaccharides were highly digestible with values of 0.98, 0.88 and 0.99 for arabinose, xylose and uronic acid components, respectively. Calculated volatile fatty acids (VFA) absorption from the large bowel was 5-fold higher with the highest level of beans and this was reflected in higher concn. of VFA in portal and heart blood. AA

Peas

2095

Ros (G) and Rincon (F). **Changes in some constituents of pea seed during commercial canning.** *Plant Foods for Human Nutrition* 43(3); 1993; 233-240

Changes in crude protein (CP), non protein nitrogen (NPN), total sulphur (TS) contents, C/N and N/S ratios and albumin protein (AP) were studied in 4 sizes of peas at various stages of the commercial canning process (CCP). NPN, AP and TS decreased during the CCP. The use of these 3 parameters is proposed to obtain a Heat Treatment Index (HTI) applicable to raw, blanched and canned peas, according to the equation: HTI = (NPN x AP)/TS. AA

Pigeonpeas

2096

Singh (U). **Protein quality of pigeonpea (*Cajanus cajan* (L.) Millsp.) as influenced by seed polyphenols and cooking process.** *Plant Foods for Human Nutrition* 43(2); 1993; 171-179

True protein digestibility (TD), biological value (BV) and NPU of low polyphenol pigeon pea cv. (Nylon, BDN 2 and ICPL 87067) were significantly higher than those of the high polyphenol cv. (C11, ICPL 87 and ICPL 151) when whole-seed samples were compared. Most of the polyphenols (80-90%) were concentrated in the seed-coat. Dhal samples (DS) of low (Nylon) and high (C11) polyphenol cv. revealed no large differences in TD, BV and NPU values. This indicated an adverse effect of seed-coat polyphenols on protein quality of pigeon pea whole-seed. The cooking process significantly increased TD in both whole seed and DS. BV of both whole-seed and DS was reduced by cooking. However, NPU of the cooked whole-seed and DS was significantly higher than in the raw samples. No noticeable differences due to cooking were observed in amino acid composition of whole-seed and DS of these cv. AA

OILSEEDS AND NUTS

2097

Badifu (GIO). **Food potentials of some unconventional oilseeds grown in Nigeria - a brief review.** *Plant Foods for Human Nutrition* 43(3); 1993; 211-224

A brief review on seeds of *Citrullus* and *Cucumeropsis* ('egusi' melon) spp., *Telfairia occidentalis* (fluted pumpkin) and *Lagenaria* (gourd) spp. (all of the Cucurbitaceae), and other oilseeds such as *Pentaclethra macrophylla* (African oil bean), *Parkia* spp. (African locust bean), (both of the Mimosaceae), and *Butyrospermum paradoxum* ((shea butter) Sapotaceae family), which are grown and widely used as food in Nigeria is presented. Seeds of spp. of Cucurbitaceae form the bulk of unconventional oilseeds used for food in Nigeria. The nutritional value of some of the seeds and the physicochemical properties and

storage stability of the oils obtained from them are discussed. The various consumable forms in which they exist are also described. The problems and prospects of these neglected oilseeds in Nigeria are highlighted. 30 references. BV

2098

Ogbobe (O) and Akano (V). **The physico-chemical properties of the seed and seed oil of *Jatropha gossipifolia*.** *Plant Foods for Human Nutrition* 43(3); 1993; 197-200

The physicochemical properties of the seed and seed oil of *Jatropha gossipifolia* were assessed by standard methods. Seed contained 35.8% crude oil of iodine value 107.25, 13.40% protein, 9.25% fibre, 30.32% carbohydrate and 6.0 g/kg saponins. Fatty acid composition of the seed oil was determined by GC-MS. Caprylic, myristic, palmitoleic, palmitic, oleic, stearic, linoleic, vernolic, arachidic, behenic and lignoceric acids were found. AA

2099

Reddy (NS) and Hotwani (MS). ***In vitro* availability of iron from selected nuts and oilseeds.** *Plant Foods for Human Nutrition* 43(3); 1993; 247-250

Availability of Fe from 16 var. of selected nuts and oilseeds was assessed *in vitro*. Contents of total and ionizable Fe and bioavailability of Fe ranged from 6.3 to 62.1 mg/100 g, 3.4 to 0.3 mg/100 g and 2.5 to 16.8%, respectively, in the nuts and oilseeds examined. Total Fe content was highest in niger seeds and lowest in linseeds. Bioavailability of Fe was significantly high from pistachio nut and almond and markedly low from groundnut. Most of the nuts and oilseeds had less than 10% bioavailability of Fe; hence, they were not considered as good sources of Fe among plant foods. AA

Cashew

2100

Aderiye (BI) and Mbadiwe (UV). **Alcohol production in submerged cashew pomace.** *Plant Foods for Human Nutrition* 43(3); 1993; 273-278

Variations in the total titratable acidity, hydrogen ion concn., reducing sugar, soluble solids and alcohol contents of the supernatant of submerged cashew pomace in a non-aseptic condition were investigated. Crude fibre content of the pomace was also determined during fermentation. Changes in microbial load in both the pomace and its supernatant were examined at intervals during the 14-day study. 54% of total soluble solids (TSS) was utilized within 7 days of degradation while an increase of approx. 91% in total titratable acidity occurred within the same period, increasing the pH to 3.24. Acid hydrolysis of the pomace accounted for the relatively high value of 2.15% TSS on the 8th day. Isolates of *Leuconostoc*, *Lactobacillus*, *Pediococcus*, *Aspergillus*, *Rhizopus* and some yeast strains were obtained from fresh pomace. Fungal colonies constituted about 76% of the population in cashew pomace. An 86% decline in microbial population of the 8th day biodegraded pomace could be attributed to a decrease in substrate nutrients and the inhibitory effect of organic acids produced during fermentation. AA

Groundnuts

2101

Patil (UG), Chavan (JK), Kadam (SS) and Salunkhe (DK). **Effects of dry heat treatments to peanut kernels on the functional properties of the defatted meal.** *Plant Foods for Human Nutrition* 43(2); 1993; 157-162

Dry heat treatments of peanut kernels at 140°C for 20 min or 160°C for 10 min significantly improved protein solubility, water and oil absorptions, foaming capacity and stability and least gelation concn. of the defatted meal. However, heat treatments at 160°C for greater than 30 min resulted in significant decrease in these properties. Such heat treatments significantly decreased the level of albumin and globulin fraction with concomitant increase in glutelin fraction in the meal. AA

Soybeans

Soy products

Soy milk

2102

Chopra (R) and Prasad (DN). **Standardization of soaking conditions for soybean seeds/cotyledons for improved quality of soymilk.** *Indian Journal of Animal Science* 64(4); 1994; 405-410

Actual time necessary for complete soaking of soybean seeds was studied. Soybean seeds/cotyledons were soaked in 0.25% sol. of sodium bicarbonate at different temp. Optimum water uptake for seeds and cotyledons was 129.0 and 117.0% respectively. Extended soaking beyond this stage resulted in loss of soluble solids in soak sol. Rate of water uptake increased with increase in temp., and declined with increase in soaking time. Min. time required for complete soaking of seeds was 8, 10, 12 and 14 h at 35, 30, 25 and 20 C respectively. Max. soaking time for cotyledons was only 2 h at above temp., but is not recommended for soymilk processing in view of flavour problems. The cotyledons can be directly blanched as per standard procedures. AA

TUBERS AND VEGETABLES

Onions

2103

Howard (LR), Yoo (KS), Pike (LM) and Miller (GHJr). **Quality changes in diced onions stored in film packages.** *Journal of Food Science* 59(1); 1994; 110-112, 117

Effects of a potassium permanganate gas absorbent and storage at 2°C on quality changes in modified atm. packaged diced onions [*Allium cepa* L. cv. Texas Grano 1015Y] were studied. A 3 mil packaging film resulted in equilibrated O_2 of 2.65% and CO_2 level of 3.65%. Gas absorbent resulted in reduced ethylene, CO_2 and sulphur volatiles. Max. shear force values and total phenolics increased during storage, but were not affected by gas absorbent. Glucose and fructose concn. declined within 1 day after processing, which coincided with an increase in sucrose. Sugar concn. remained stable thereafter and were not affected by gas absorbent. Microbe cfu increased during storage to 5.8 in controls and 7.1 (log cfu/g) in absorbent treated samples after 10 days at 2°C. AA

Root vegetables

Carrots

2104

Izumi (H) and Watada (AE). **Calcium treatments affect storage quality of shredded carrots.** *Journal of Food Science* 59(1); 1994; 106-109

Carrot shreds, sticks and slices were dipped in solutions of $CaCl_2$ alone or with chlorine and stored at 0, 5 or 10°C to determine the effects of Ca on storage quality. A 0.5 or 1% $CaCl_2$ treatment maintained firmness and reduced microbial growth of carrot shreds at all temp. These treatments also resulted in lower tissue pH than in the water-dipped controls. Treatments increased Ca content slightly in sticks and slices and substantially in shreds and had no effect on storage quality of sticks or slices. AA

Cassava

2105

Adegoke (GO), Akinnuoye (OFA) and Akanni (AO). **Effect of processing on the mycoflora and aflatoxin B1 level of a cassava-based product.** *Plant Foods for Human Nutrition* 43(3); 1993; 191-196

Cassava bread was prepared by pre-gelling, battering and baking cassava flour and adding, in moderate amounts, sugar, yeast solution and edible oil. Baking was at 215°C for 40 min. No fungi were isolated from the cassava bread; the mean concn. of aflatoxin B1 (AFB1) in 3 subsamples of cassava bread was 0.03 µg/kg. The cassava tuber (*Manihot esculenta* Crantz) which was used for the production of cassava bread had an initial AFB1 level of 1.91 µg/kg

and the dominant mycoflora were *Penicillium oxalicum*, *Aspergillus flavus*, *Fusarium* spp. and some unidentified fungi. AA

Tubers

Potatoes

2106

Ryang (HK) and Eliasson (AC). **Changes in rheological properties of hydroxypropyl potato starch pastes during freeze-thaw treatments. II. Effect of molar substitution and cross-linking.** *Journal of Texture Studies* 24(2); 1993; 199-213

The effects of molar substitution (mol. s.) and cross-linking on the freeze-thaw stability of hydroxypropyl potato starch pastes were studied. Effects were monitored by following the changes in the rheological behaviour during heat treatment of the thawed starch pastes and by determination of syneresis. DSC was used to investigate the thermal transition properties of the starch pastes that exhibited syneresis. With increasing mol. s., changes in both complex modulus (G*) and phase angle (delta), indicative of destabilization and starch paste syneresis were delayed with regard to the number of freeze-thaw cycles. When a starch paste showed a peak in G*, related to syneresis, it also showed a thermal transition peak in the DSC measurements. The enthalpy value decreased with increasing mol. s., and it appeared to be related to the extent of syneresis and the magnitude of the peak in G*. Comparison of the rheological behaviour of hydroxypropyl potato starch pastes and cross-linked potato starch pastes, suggested that the former were gradually transformed into coarsely aggregated structures while the latter became diluted starch dispersions, due to shrinkage of swollen starch granules and their disruption. AA

Vegetables

2107

Hao (YY) and Brackett (RE). **Pectinase activity of vegetable spoilage bacteria in modified atmosphere.** *Journal of Food Science* 59(1); 1994; 175-178

A modified atm. of 10% CO_2, 5% O_2 and 85% N_2 was used to determine effects on pectinase activities of vegetable spoilage bacteria. Cultures of *Erwinia carotovora* [ATCC 15713], *Pseudomonas fluorescens* [78/34] and *Xanthomonas campestris* [ATCC-1 11551], grown at 25°C in liquid medium held under the modified atmosphere, were assayed for polygalacturonase and pectate lyase activities. *Erwinia* and *Pseudomonas* exhibited higher polygalacturonase and pectate lyase activities than *Xanthomonas*, whether grown under modified atmosphere or air. In some cases, bacteria grown under air exhibited higher pectinase activity. In general, modified atmosphere did not significantly reduce pectinase activities in any of the bacteria tested. AA

2108

Bourquin (LD), Titgemeyer (EC) and Fahey (GCJr). **Vegetable fiber fermentation by human fecal bacteria: cell wall polysaccharide disappearance and short-chain fatty acid production during in vitro fermentation and water-holding capacity of unfermented residues.** *Journal of Nutrition* 123(5); 1993; 860-869

Dietary fibre from 8 vegetables (broccoli, carrot, cauliflower, celery, cucumber, lettuce, onion and radish) was analysed for chemical composition and potential in vitro fermentation by human faecal bacteria. Total dietary fibre concn. of substrates ranged from 34.9 (broccoli) to 5.8 (cucumber) g/kg edible matter. Substrate fibre fractions were composed primarily of pectic substances and cellulose with smaller concn. of hemicelluloses and lignin. Total dietary fibre residues isolated from substrates were fermented in vitro for 24 h with faecal bacteria obtained from each of 3 human volunteers. Substrate DM disappearance during fermentation was highest for carrot (63.7%) and lowest for cucumber (49.4%). Averaged across all substrates, disappearances of arabinose, galactose, glucose, mannose, xylose and uronic acids during fermentation were 96, 90, 54, 68, 51 and 97%, respectively. Short-chain fatty acid (SCFA) production during substrate fermentation averaged 10.5 mmol SCFA/g DM fermented. Averaged across all substrates, production of the major SCFA,

acetate, propionate and butyrate, occurred in the molar ratio 76:14:10. Potential water-holding capacity of substrates was not influenced by fibre source and averaged 2.04 g H_2O/g original substrate DM. Extent of substrate fermentation, SCFA production and substrate potential water-holding capacity were significantly different among inoculum donors, indicating that considerable inter-individual variation exists in the potential in vivo fermentation of vegetable fibre. AA

Cabbage

2109

Hang (KK) and Fleming (HP). **Antibacterial activity of cabbage juice against lactic acid bacteria.** *Journal of Food Science* 59(1); 1994; 125-129

The growth of 7 strains of lactic acid bacteria including 4 species [*Leuconostoc mesenteroides* C33, ATCC 2893 and NCK 293; *Lactobacillus plantarum* W50 and ATCC 14917; *Lactococcus lactis* NCK 400; and *Pediococcus pentosaceus* ATCC 33316] was tested first in fresh and heated juices of Cecile cv. cabbage. Inhibition was eliminated when the cabbage was steamed for 10 min before juice extraction. When *L. mesenteroides* C33 was tested in juices of 3 other cabbage cv., growth inhibition was invariably noted in fresh juices, but was variable in heated juices. Fresh cabbage juice (CJ) adjusted to higher initial pH (6.5-7.5) showed greater antibacterial activities than at pH 5.0-6.0. When pH 4.0 precipitate from fresh CJ was added to noninhibitory CJ (cabbage heated before extraction), antibacterial activity was restored. A heat-labile and pH-dependent factor seemed responsible for activating a precursor into an inhibitory compound. AA

Leafy vegetables

2110

Pandey (VN) and Srivastava (AK). **A simple, low energy requiring method of coagulating leaf proteins for food use.** *Plant Foods for Human Nutrition* 43(3); 1993; 241-245

A simple method for coagulating proteins in aqueous leaf extract through microbial fermentation is reported. Leaf extract of *Medicago polymorpha* L. was mixed with 1 g of starter culture (curd containing *Lactobacillus acidophilus* and *Streptococcus lactis*) and incubated at 35°C for 12 h. The coagulated protein was separated, dried and made into laddu for sensory evaluation. The leaf protein concentrate (LPC) obtained through fermentation was compared with that obtained through conventional heat coagulation methods. Fermentation of leaf extract improved yield, aroma, in vitro digestibility and nutritional value of LPC. Results indicated that microbial fermentation of leaf extract is suitable for small-scale, domestic production of LPC. BV

Amaranthus

2111

Bressani (R), de Martell (ECM) and de Godinez (CM). **Protein quality evaluation of amaranth in adult humans.** *Plant Foods for Human Nutrition* 43(2); 1993; 123-143

The nutritional quality of popped (PA) and extruded amaranth (EA) grain (*Amaranthus cruentus*) was determined using a nitrogen balance study with 12 healthy adult men. The study consisted of 3 periods of 9 days each in which subjects were initially fed a low N diet, followed by increases of protein level every 2 days. Protein levels were 0.2, 0.4 and 0.6 g/kg/day and the sole protein source was EA or PA or processed cheese (as reference). Results indicated that true digestibility of protein was 101.4, 89.9 and 85.5% for cheese, EA and PA, respectively. There was no significant difference in digestibility between the 2 forms of amaranth. N balance index values between absorbed and retained N were 0.97, 0.98 and 0.96 for cheese, EA and PA, indicating that amaranth provides a good source of high quality protein. BV

2112

del Valle (FR), Escobedo (M), Marroquin (SA), Bourges (H), Bock (MA), Biemer (P). **Chemical and nutritional evaluation of two amaranth (*Amaranthus cruentus*)-based infant formulas.** *Plant Foods for Human Nutrition* 43(2); 1993; 145-156

Two infant formulas (IF) based on amaranth (*Amaranthus cruentus*) were prepared and their PER and NPU were evaluated. Both IF were formulated to match a previously developed and tested soy-oats IF. No significant differences were found between the 3 IF with respect to corrected PER and NPU values. Only the product made with the 1-R fraction of amaranth had a significantly lower PER than casein. BV

2113

Lopez (PO), Mendoza (V) and Mora (R). **Isolation of amaranth flour proteins by fractionation procedures and sonication.** *Plant Foods for Human Nutrition* 43(1); 1993; 37-43

The use of whole and defatted amaranth flour for protein isolation of Osborne fractions is described. Extractability of prolamins, the minor fraction, increased from 2.8 to 5% by adding a reducing agent. Glutelins proved to be poorly solubilized (3.3%) in dilute acetic acid, but they reached a high solubility value (40.8%) using a borate buffer in the presence of a reducing agent and a detergent; solubility remarkably declined without the latter 2 chemicals. Sonication (a fast and simple technique) in the presence of a detergent proved to be more efficient, compared with stirring, for extractability of total unreduced proteins. AA

Melons

2114

Adegoke (GO) and Ndife (J). **Effect of sample pretreatments on the storability of ground melon 'egusi' - *Colocynthis citrullus* L.** *Plant Foods for Human Nutrition* 43(1); 1993; 77-85

In the maintenance of shelf-life, nutritional and organoleptic properties of ground melon seeds, 'egusi' *Colcynthis citrullus* L., vacuum-packaged samples were found to be better than unpackaged samples and samples treated with 0.2% BHA and 0.02% BHA + 0.045% sodium metabisulphite. After 56 days at 35°C, stored samples showed significant differences (P less than or equal to 0.01) in chemical composition, peroxide value, fungai counts and organoleptic attributes. Lipid oxidation and, to a lesser extent, fungal deterioration were responsible for the spoilag of stored ground melon kernel. The dominar fungal flora isolated from stored samples we the genera *Penicillium*, *Botryodiplodi Rhizopus* and *Aspergillus*. AA

Tomatoes

2115

Bizri (JN) and Wahem (IA). **Citric acid an antimicrobials affect microbiologica stability and quality of tomato juice.** *Journ of Food Science* 59(1); 1994; 130-134

Reports the effects of citric acid an antimicrobials (dimethyl dicarbonate and mixture of potassium sorbate and sodiu benzoate) on microbiological stability an quality of tomato juice stored at 5 and 20° Whether juices were acidified (pH 4.0 to 3.7) nonacidified, dimethyl dicarbonate an sorbate/benzoate were highly effective i diminishing fungi and yeast counts at 5 an 20°C. Dimethyl dicarbonate in juices acidifie to pH 3.7 and stored at 5°C was most effectiv in controlling plate counts, followed b sorbate/benzoate in juices acidified to pH 3 and stored at 5 and 20°C. Tomato juice treate with dimethyl dicarbonate had lower amoun of ascorbic acid, total amino acids, fructos glucose, lycopene and β-carotene. SRA

2116

Kokini (JL) and Chou (TC). **Comparison of th conformation of tomato pectins with appl and citrus pectins.** *Journal of Texture Studie* 24(2); 1993; 117-137

Molecular conformation (MC) of processe tomato pectin extracted from hot break toma paste, was examined and compared to app and citrus pectins. MC were compared usi storage and loss moduli and a rod-lik behaviour theory and a random coil (R conformation theory. The RC theory, implyi dominant hydrodynamic interactions, be fitted the experimental data. Results we consistent with current knowledge of th chemical structure of pectin where the charge uronides clearly readily interact with eac other. BV

2117

Yaron (AA), Feigin (A) and Rylski (I). **The quality of tomato for canning as affected by combined chloride, nitrate and osmotic potential of the nutrient solution.** *Plant Foods for Human Nutrition* 43(3); 1993; 201-210

The [canning] quality of tomato (*Lycopersicon esculentum* L. cv. VF M82-1-8) fruit and tomato juice grown in an aerohydroponic system in a greenhouse was affected by the level of Cl^- and NO_3^-, and by the osmotic potential (OP) of the nutrient solutions. Total suspended solids (degree Brix) in the fresh juice increased from approx. 4.0 in the nonsaline sol. (OP -0.05 MPa) to approx. 5.6-5.8 in the saline sol. (OP -0.45 MPa). Juice acidity was similarly affected by Cl^-, NO_3^- and OP levels in the nutrient sol. Ascorbic acid content of juice was lowest (8-9 mg/100 cm^3) in the high-NO_3^- -nonsaline sol. treatments, and was between 10 and 12 mg/100 cm^3 at OP levels > -0.2 MPa. NO_3^- in juice was high (60 mg/l) under low OP conditions (--0.05 to -0.1 MPa), especially when combined with high NO_3^- levels, and lower (between 8 and 30 mg/l) in plants exposed to saline conditions (low OP). Fruit puffiness (boxiness) was reduced markedly by salinity and was not considerably affected by the NO_3^-/Cl^- ratio, while fruit firmness was influenced by both factors. AA

Water melon

2118

Nwosu (CD) and Ojimelukwe (PC). **Improvement of the traditional method of ogiri production and identification of the micro-organisms associated with the fermentation process.** *Plant Foods for Human Nutrition* 43(3); 1993; 267-272

Fermented products were developed from different proportions of water melon (*Citrullus vulgaris* Schrad) and groundnut (*Arachis hypogaea*) seeds after a 96 h fermentation period. Proximate analysis, carried out on both fermented and unfermented samples, indicated that only the total carbohydrate content was appreciably reduced by the fermentation process. Microorganisms responsible for fermentation were identified by Gram staining and lactophenol staining as bacteria and fungi; bacteria were from the *Bacillus* and *Acinetobacter* spp., while the fungi were yeasts, Rhizopus and Mucor. Samples containing 50-100% water melon showed a decrease in pH with increasing fermentation period. Bacteria were largely responsible for fermentation in samples containing up to 75% groundnuts. Sensory analysis of dried fermented products after fortification with salt, ascorbic acid and flour indicated that they were acceptable. AA

FRUITS

2119

Alzamora (SM), Tapia (MS), Argaiz (A) and Welli (J). **Application of combined methods technology in minimally processed fruits.** *Food Research International* 26 (2); 1993; 125-130

Processes developed for preserving high moisture fruit (peach, pineapple, mango, papaya, chicozapote, banana) products in 7 countries using the CYTED-D [Science & Technology for Development, Fifth Centennial] Program are described. The new technologies are based on a combination of a mild heat treatment, a slight a_w reduction and addition of antimicrobial agents (hurdle effect). These minimal processes are energy efficient, satisfactory for preserving fruits in situ and open new possibilities for export markets. The high moisture fruit products are shelf-stable during at least 4-8 months of storage. BV

Apples

2120

Karaoulanis (GD) and Dilley (D). **Ethanol content of ripening apples (variety Mutsu) and ethylene production during storage under anaerobic conditions at room temperature.** *International Journal of Refrigeration* 16(5); 1993; 364-366

Production of ethylene, acetaldehyde and ethanol in apples (Mutsu var.) during ripening under anaerobic conditions at room temp. was investigated. Results indicate that as the concn. of ethanol increased, ethylene production reached a max. of 23 p.p.m., and acetaldehyde reached its max. value of 690 µl ml^{-1}. During the same period, the concn. of O_2 decreased to a min. level of 2%. BV

2121

El Shimi (NM). **Control of enzymatic browning in apple slices by using ascorbic acid under different conditions.** *Plant Foods for Human Nutrition* 43(1); 1993; 71-76

Control of polyphenol oxidase activity in apple slices (AS) by the use of ascorbic acid at different pH values, temp. and time of incubation was investigated. The enzyme was almost inactivated at 1 and 1.5% ascorbic acid. Ascorbic acid solution (1%) caused marked inhibition with increasing acidity up to pH 1. Heating of AS dipped in 1% ascorbic acid caused a reduction of enzymic browning; optimum temp. for inactivation of the enzyme was between 60 and 70°C for 15 min. Increasing the time of dipping AS in 1% ascorbic acid solutions and different pH values reduced phenolase activity. AA

Banana

2122

Offem (JO) and Thomas (OO). **Chemical changes in relation to mode and degree of maturation of plantain (*Musa paradisiaca*) and banana (*Musa sapientum*) fruits.** *Food Research International* 26 (3); 1993; 187-193

Changes in proximate and mineral constituents of plantain and banana fruits were monitored with time, beginning 60 and 90 days from bunch visible emergence, respectively, for fruits allowed to ripen on and off the plants. For fruits on the plants, the point of min. moisture content for pulp and/or peel corresponded to max. maturity for both plantains and bananas. Protein levels increased with time in fruits on the plants, and plantains had higher protein content than bananas at the same stage of maturity. Sugar content in both fruits increased gradually up to 92 days, then increased sharply at onset of ripening and continued increasing through the rest of the experimental period. At identical ages, harvested fruits contained far more sugar ($P > 0.05$) than fruits allowed to ripen on the plants. Energy values increased gradually with time and reached a max. at max. maturity of both fruits. The values were consistently higher for plantains than for bananas (t-test, P less than or equal to 0.01). Virtually all mineral studied had statistically higher values i plantain fruits than in bananas. AA

2123

Sarathathevy Suntharalingam and Ganesharanee Ravindran. **Physical and biochemical properties of green banana flour.** *Plant Foods for Human Nutrition* 43(1) 1993; 19-27

Banana flour (BF) prepared from 2 cooking banana var. Alukehel and Monthan, were evaluated for their physical and biochemica characteristics. Yields of flour averaged 31.3% for Alukehel and 25.5% for Monthan. pH of the flour ranged from 5.4 to 5.7. Bulk density and particle size distribution were also measured The average chemical composition (%DM) of the flours were as follows: crude protein, 3.2; crude fat, 1.3; ash, 3.7; neutral detergent fibre, 8.9 acid detergent fibre, 3.8; cellulose, 3.1; lignin 1.0; and hemicellulose, 5.0. Carbohydrate composition indicated that flour contained 2.8% soluble sugars, 70.0% starch and 12.0% non-starch polysaccharides. Potassium was the predominant mineral in BF. Fresh green banana is a good source of vitamin C, but almost 65% is lost during the preparation of flour. Oxalate content (1.1-1.6%) of BF is probably nutritionally insignificant. Results are indicative of the potential of green bananas as a source of flour. AA

Cherries

2124

Sapers (GM). **Color characteristics and stability of nonbleeding cocktail cherries dyed with carotenoid pigments.** *Journal of Food Science* 59(1); 1994; 135-138

Experimental cocktail cherries dyed with carotenoids and commercial cherries were compared by spectrocolorimetry to determine colour characteristics and stability. Cherries dyed with canthaxanthin, apo-carotenal and oleoresin paprika were more tomato- or orange-red than cherries dyed with Red No. 40 Red No. 3 or carmine. No colour bleeding was observed with carotenoid-dyed cherries. The colour of cherries dyed with canthaxanthin was stable for 1 yr at 4°C. Colour stability was no

as good in cherries dyed with apo-carotenal but could be improved greatly by addition of EDTA and ascorbic acid to preservative solutions in which cherries were stored. AA

Grapes

2125

Sefton (MA), Francis (IL) and Williams (PJ). **Free and bound volatile secondary metabolites of *Vitis vinifera* grape cv. Sauvignon Blanc.** *Journal of Food Science* 59(1); 1994; 142-147

Free volatiles, and those hydrolytically released from glycosidic forms, were analysed for Sauvignon Blanc grape juices from 3 successive vintages. Most of the 213 compounds identified were in 1 of the biogenetic categories: norisoprenoids; benzene derivatives; monoterpenes; or aliphatics. Several were not previously reported as grape components. Monoterpenes were in lower concn. than normally found in floral grape var., but at higher levels than reported in Chardonnay juices. 40-50% of the bound monoterpenes were monocyclic. Hydration of α-terpineol at pH 3 gave c-4-(1-hydroxy-1-methylethyl)-1-methyl-r-1-cyclohexanol (cis-p-menthane-1,8-diol) and t-4-(1-hydroxy-1-methylethyl)-1-methyl-r-1-cyclohexanol (trans-p-menthane-1,8-diol) as the main products and a low yield of t-4-(1-methylethyl)-r-1-methylcyclohexane-1,4-diol (trans-p-menthane-1,4-diol). These were confirmed as major components of the acid hydrolysates of the bound fraction. AA

Strawberries

2126

Sanz (C), Perez (AG) and Richardson (DG). **Simultaneous HPLC determination of 2,5-dimethyl-4-hydroxy-3 (2H)-furanone and related flavor compounds in strawberries.** *Journal of Food Science* 59(1); 1994; 139-141

A rapid method (< 90 min) is described for the qualitative and quantitative analysis of 2,5-dimethyl-4-hydroxy-3 (2H)-furanone (furaneol), furaneol-beta-glucoside and 2,5-dimethyl-4-methoxy-3 (2H)-furanone (mesifurane) in strawberries. These compounds were resolved by HPLC with a reverse phase C18 column, using acetate buffer and methanol as binary mobile phase and detection at 280 nm, and confirmed by GC-MS. The aqueous extraction procedure gave an average recovery of these compounds from strawberries > 90%, with detection limits: 0.14 furaneol, 0.05 furaneol-β-glucoside and 0.36 μg/ml mesifurane. AA

CONFECTIONERY, STARCH AND SUGAR

Chocolates

Cocoa beans

2127

Valiente (C), Esteban (RM), Molla (E) and Andreu (LFJ). **Roasting effects on dietary fiber composition of cocoa beans.** *Journal of Food Science* 59(1); 1994; 123-124, 141

The effect of roasting on dietary fibre fractions of cocoa beans was determined by gravimetric and fractionation procedures after enzymic treatment. Roasting had no notable effect on total dietary fibre content. Components of insoluble dietary fibre (IDF) were redistributed after roasting. One of the largest changes was a sharp increase of Klason lignin. The noted decrease in sugar content without a change in IDF suggested that neutral sugars and uronic acids may be involved in Maillard polymer formation. Soluble dietary fibre did not show large variations. Undigestible protein in IDF increased after roasting. AA

Sugars

2128

Arvanitoyannis (I) and Blanshard (JMV). **Rates of crystallization of dried lactose-sucrose mixtures.** *Journal of Food Science* 59(1); 1994; 197-205

The isothermal crystallization kinetics of glassy lactose/sucrose mixtures were studied at several storage temp. (close to T^g and T^m). The kinetic parameters implicit in the Avrami equation were determined. Activation energies

for transport (E_D) and surface nucleation (W^*) were also found and correlated to the molar composition of the lactose/sucrose mixtures. A monotonic increase in the half crystallization time ($t_{1/2}$), Avrami index (n), % crystallization per day, E_D and W^*, and a decrease in the crystallization velocity constants were related to increases in the lactose content of lactose/sucrose mixtures. AA

BAKERY PRODUCTS

2129

Martinez-Anaya (MA), Benedito de Barber (C) and Collar Esteve (C). **Effect of processing conditions on acidification properties of wheat sour doughs.** *International Journal of Food Microbiology* 22(4); 1994; 249-255

In this paper, a surface response design has been applied in order to optimise sour dough preparation, using 2 strains of *Lactobacillus plantarum* (B 33, B 39) as bacterial starter. Factors included were flour extraction rate (FER) at (0.54, 11.11 and 1.68% ash content) fermentation temp. (25, 30 and 35 C), dough consistency and yeast addition. Results showed that the FER governs total titratable acidity (TTA) and acetic acid content. This factor accounts for the 53% of variability of the data. Influence of FER on acetic acid and lactic acids levels were noticeable principally for B39. From K-means clustering analysis, FER of 1.68% ash content leads to the highest TTA and acetic acid values, whereas dough yield (DY) of 240 g sour dough/100 g flour gives the greatest lactic acid content, and DY of 160 leads to the lowest levels of TTA and organic acids. SRA

2130

Rohde (F), Normand (MD) and Peleg (M). **Characterization of the power spectrum of force-deformation relationships of crunchy foods.** *Journal of Texture Studies* 24(1); 1993; 45-62

The mean magnitude of the power spectra of the compressive force-deformation relationships of breadsticks, pretzels and zwiebacks, exposed to 5 levels of RH, was determined at various cutoff frequencies. In all 3 foods the mean magnitude had a linear correlation with the Fractal dimension of the normalized original force-deformation relationship, regardless of the cutoff frequency. This implies that jaggedness of the force-deformation curve, which is most probably a manifestation of crunchiness or crumbliness, can be quantified by an additional single numerical index, the mean magnitude of the power spectrum. The correlation's independence of the cutoff frequency is an indication that the loss of crunchiness, as a result of moisture sorption, can be expressed in the shape of the whole spectrum and not only in its high frequency region. AA

Biscuits

2131

Singh (B), Bajaj (M), Kaur (A), Sharma (S) and Sidhu (JS). **Studies on the development of high-protein biscuits from composite flours.** *Plant Foods for Human Nutrition* 43(2); 1993; 181-189

Composite flours prepared from wheat, greengram, bengalgram and blackgram flours were studied for the preparation of biscuits. Protein content of biscuits increased as the level of the pulse flours increased. Wheat flour containing bengalgram and blackgram flours adversely affected the top grain, texture and colour of biscuits. Biscuits made with higher levels of bengalgram (> 15%) were tough and difficult to break and required higher compression force. Addition of greengram flour did not significantly affect top grain, texture and colour of biscuits. Biscuits made from 15% greengram supplemented wheat flour scored the highest for flavour characteristics. Thickness, diam. and spread ratio of biscuits containing different levels of pulse flours were significantly different from control samples. Sensory evaluation scores showed that acceptable biscuits can be prepared from wheat flour supplemented with these pulse flours at a level of 15%. AA

Bread

2132

Key (FB) and Mathers (JC). **Gastrointestinal responses of rats fed on white and**

wholemeal breads: complex carbohydrate digestibility and the influence of dietary fat content. *British Journal of Nutrition* 69 (2); 1993; 481-495

To obtain quantitative information on the digestibility of the non-starch polysaccharides (NSP) fraction of white and wholemeal breads, rats were fed on diets in which freeze-dried bread (white, wholemeal or mixtures of the 2) provided all the complex carbohydrates. In a 2nd experiment the influence of dietary fat concn. on NSP digestibility was tested by feeding diets containing 30 or 170 g corn oil/kg and either white or wholemeal bread. Multiple linear regression analysis provided little evidence of associative effects of dietary components on NSP digestibility and in both experiments digestibilities of NSP for white and wholemeal breads were 0.77-0.82 and 0.47-0.52, respectively. Xylose- and arabinose-containing polymers were better digested than cellulose for both breads. Replacing white by wholemeal bread markedly increased the molar proportion of butyrate in caecal volatile fatty acids at the expense of acetate. There was little detectable effect of dietary corn oil concn. on NSP digestibility or on large bowel fermentation. All breads contained some starch resistant to pancreatic alpha-amylase (EC 3.2.1.1.) without previous treatment with dimethyl sulphoxide. The digestibility of this starch fraction was not significantly different from 1.0 for any diet except that containing wholemeal bread and the higher corn oil concn. where the apparent digestibility was 0.89. AA

2133
Oda (Y) and Tonomura (K). **Dough-leavening by *Zymomonas mobilis* and its application to breadmaking.** *Journal of Food Science* 59(1); 1994; 171-174

Among 5 strains of *Z. mobilis* strain Z6C had the highest leavening ability in dough containing either glucose or sucrose. Z6C most efficiently leavened the dough when it contained 5% sucrose, and this leavening ability was 2x that of commercial compressed yeast. At the same concn. of NaCl [greater than 0.55], the leavening ability of Z6C was reduced more than that of bakers' yeast. When compared with baked goods made with yeast, those made with Z6C had similar specific vol., but Z6C baked goods had slight acidic flavour. Chromatographic analysis of headspace gas of yeast-leavened bread showed that 2 chemicals appearing in Z6C leavened bread were missing. AA

Cakes

2134
Pateras (IMC), Howells (KF) and Rosenthal (AJ). **Hot-stage microscopy of cake batter bubbles during simulated baking: sucrose replacement by polydextrose.** *Journal of Food Science* 59(1); 1994; 168-170, 178

A hot-stage video microscopical technique was developed to study the effects of sucrose replacement by polydextrose, [a nonsweet, low-calorie bulking agent which can contribute many of the functional benefits of sucrose] on the foam characteristics of cake batters, before and during heating. Polydextrose substitution increased mean size of air-bubbles in the cake batter and introduced a larger variation in bubble size distribution than in sucrose batter. Differences between sucrose and polydextrose batters on initial bubble size distribution were reflected in expansion rates of bubble populations during heating. Lack of uniformity in the bubble distribution of batters containing polydextrose increased the rate of gas diffusion from small bubbles to larger ones. On heating, the bubble population of sucrose batters expanded more than that of polydextrose-substituted batters. AA

Cookies

2135
Villarroel (M), Biolley (E), Bravo (S), Carrasco (P) and Rios (P). **Characterization of Chilean hazel nut sweet cookies.** *Plant Foods for Human Nutrition* 43(3); 1993; 279-285

A series of studies was carried out to test the effect of the incorporation of Chilean hazelnut flour (CHF) as a partial substitute for wheat flour in sweet cookies at levels of 0, 5, 10, 15 and 20%. The proximate chemical analysis of the different flour mixtures showed a regular increase in protein content from 7.2 to 12.2%, in ether extract from 14.5 to 18.8%, and in

crude fibre from 1 to 2.2%. There were concomitant decreases in % moisture and carbohydrates. Chemical amino acid scores of leucine and threonine in wheat flour improved with the incorporation of CHF. Farinographic evaluation of the different blends showed several changes occurring with the incorporation of CHF. These included increase in water absorption, decrease in dough developing time and weakening of the dough. Sensory characteristics such as appearance, texture, flavour and also acceptability improved with the incorporation of CHF into the cookie formula. AA

Pastry

2136

Sim (BJ), Lucas (PW), Pereira (BP) and Oates (CG). **Mechanical and sensory assessment of the texture of refrigerator-stored spring roll pastry.** *Journal of Texture Studies* 24(1); 1993; 27-44

Spring rolls (or popiah) consists of a filling surrounded by a thin layer of pastry. The pastry is subjected to tension as it is wound around the filling. Refrigeration of the pastry before use results in the formation of cracks and effects the texture. After refrigeration for 1 day, the Young's modulus of the pastry increased 10 fold, tensile strength and critical stress intensity factor also increased but to a lesser extent, and strain to failure decreased. In the single edge notched test and trouser tear test, which create free running cracks, fresh pastry was tougher than stored pastry due to blunting of the crack tips by large elastic strains. In stored pastry, the energy required to propel the crack, once started, was lower than that of fresh pastry, enabling cracking to continue more easily. BV

MILK AND DAIRY PRODUCTS

2137

Aguilera (JM), Xiong (YL) and Kinsella (JE). **Viscoelastic properties of mixed dairy gels.** *Food Research International* 26 (1); 1993; 11-17

Pure and mixed gels prepared from a whey protein isolate (WPI) and skim milk powder (SMP) by heating to 90°C at pH 4.3-4.6, with or without milk fat globules, were studied by mechanical testing. Testing involved compression to 20% deformation and oscillatory rheometry (storage and loss moduli, G' and G", respectively). Compressive stresses of mixed gels varied between 0.7 and 1.9 kPa. Gels containing WPI reached higher G' values and had shorter gel-set times than those containing SMP. SMP-based gels were more elastic than WPI-based gels as revealed by the lower loss tangent (tan delta = G"/G') values achieved after 17 min (0.18-0.23 vs. approx. 0.38, respectively). Addition of fat resulted in higher compressive stresses and shorter gel-set times but did not affect the initial gelation rate. Gels with different viscoelastic and mechanical properties were prepared with varying amounts of WPI, SMP and emulsified fat. AA

Milk

2138

Christen (GL), Shen (N) and Maruri (JL). **Recovery of short chain-length fatty acids from milk by several methods.** *Dairy, Food and Environmental Sanitation* 13(12); 1993; 707-709

The copper soap method (CSM), an extraction-titration method (ETM) and GC method were compared for ability to recover butyric, caproic, caprylic, capric and lauric acids from milk. The CSM did not recover the shortest chain-length fatty acids (FAs) but ETM and GC method did. ETM was used to analyse commercial milk samples. Mean free FA content was 0.61 μ eq/mL (plus or minus 0.31 μ eq/ml). The average coeff. of variation on the duplicate was 9.5%. SRA

2139

Jain (DK), Sharma (KNS) and Surender Singh. **Seasonal, temporal and spatial variation in milk and milk product prices in Andhra Pradesh.** *Indian Journal of Dairy Science* 47(3); 1994; 181-185

2140

Iype (S), Radhakrishnan (J) and Raghavan (KC). **Influence of socio-economic factors on**

milk production of crossbred cows in Kerala. *Indian Journal of Animal Science* 63(12); 1993; 1299-1301

2141

Sharma (SK), Hill (AR) and Mittal (GS). **Effect of milk concentration, pH and temperature on aggregation kinetics and coagulation properties of ultrafiltered (UF) milk.** *Food Research International* 26 (2); 1993; 81-87

Aggregation kinetics of renneted ultrafiltered (UF) milk were monitored by measuring the complex viscosity (μ^*) at various times with a Nametre viscometer. Rate of aggregation increased with an increase in milk concn. (1x-4x) and temp. (28-37°C) and a decrease in pH (6.8-6.0). Coagulation time (CT) decreased with a decrease in pH from 6.8 to 6.0 and with an increase in temp. CT decreased with an increase in milk concn. when milk pH was unadjusted (7.0), but remained unaffected when pH was adjusted by adding lactic acid (6.8-6.0). The curd firmness index increased with an increase in both milk concn. and temp., and with a decrease in pH. Aggregation kinetics suitably followed the Scott-Blair and Burnett model ($\mu^* = \mu^* \exp(-\lambda/t^*)$), where μ^*1 = limiting value of μ^*, cP; λ = time at which $\mu^* = \mu^*1/e$ (min) and t^* = time after aggregation (min). AA

Milk products

2142

Yuan (YV) and Kitts (DD). **Milk product and constituent protein effects on plasma and hepatic lipids and systolic blood pressure of normotensive rats.** *Food Research International* 26 (3); 1993; 173-179

Effects of diets containing casein (C), whey protein concentrate (W), skim milk protein concentrate (MPC) and yoghurt powder (Y) on plasma total cholesterol, triacylglycerides and HDL-cholesterol (HDL-C), hepatic total lipids and cholesterol levels were studied in normotensive Wistar rats. Systolic blood pressure (SBP) was recorded weekly from 6 to 10 wk of age. Diet effects were compared to those in animals fed soy protein isolate (S) and rat chow (RC) diets. All groups exhibited similar growth rates. Animals fed C, W, MPC and S diets exhibited similar plasma triacylglycerides and total cholesterol levels, which were higher (P less than or equal to 5) than in Y and RC animals. HDL-C was higher (P less than or equal to 0.05) in C, W and MPC fed animals, than those fed Y or RC. HDL-C in S fed animals only approached a significantly (P less than or equal to 0.07) lower amount compared to C, W and MPC fed animals. Hepatic total lipids and cholesterol were not significantly ($P > 0.05$) different between groups. The small changes in plasma lipids observed in animals fed dairy products had little effect on SBP in normotensive rats. AA

Butter

2143

Rohm (H) and Weidinger (KH). **Rheological behaviour of butter at small deformations.** *Journal of Texture Studies* 24(2); 1993; 157-172

Rheological properties of continuously churned commercial butter samples were evaluated at small deformations. The methods performed included dynamic experiments in shear and compression, stress relaxation in shear and static compression, all at 5-20°C. Linear viscoelastic behaviour was observed up to a critical strain of 0.001. The structure breakdown due to shear strains between 0.001 and 0.01 was fully recoverable. No qualitative differences in the rheological behaviour were observed between samples. Temp.-induced variations were mainly ascribed to changes in the solid fat content (SFC). Correlations between selected rheological measures in the linear viscoelastic region were limited and only slightly affected by SFC. AA

2144

Rohm (H). **Rheological behaviour of butter at large deformations.** *Journal of Texture Studies* 24(2); 1993; 139-155

Rheological properties of traditionally produced butter samples were evaluated at large deformations by lubricated and nonlubricated uniaxial compression with varying sample geometries and compression rates, by stress relaxation in shear and creep experiments in compression at 5-20°C. Compression forces required to deform cylindrical samples in nonlubricated

conditions were higher than in lubricated cases. Correction of shape changes in nonlubricated stress-strain curves resulted in good agreement with lubricated experiments at low compression rates up to stress max. or yielding. As frictional forces were relatively smaller at high deformation rates, lower stresses were obtained in nonlubricated conditions. Samples with higher height/diam. ratios showed more pronounced stress max. A biaxial extensional viscosity, etaBE, was computed for nonbrittle, soft samples. Typical slopes in logarithmic plots of viscosity against strain rate were approx. -1. At strains of approx. 0.01 creep compliance depended on compression stress. Average ratios of recovered to initial instantaneous compliance were between 0.31 and 0.59, and increased with sample temp. A calculated etaBE from creep compression agreed well with etaBE from static compression experiments. At comparable strains, a conversion of creep compliance to the stress relaxation modulus by an approximate method showed a good fit of experimental results. AA

Butter oil

2145

Oehlmann (SM), Duncan (SE) and Keenan (TW). **Butteroil emulsification with milk-derived membrane and protein fractions.** *Journal of Food Science* 59(1); 1994; 53-56, 66

Butteroil was emulsified by homogenization or ultrasound dispersal into aqueous phases containing milk lipid globule membrane or combinations of membrane with lipid globule-derived and milk serum proteins. Stable emulsions containing about 50 mg protein/g butteroil were produced with all combinations. Protein composition of emulsions closely reflected protein composition of starting materials. Emulsions of equal stability, and with churn times equivalent to that of cream, were obtained with unprocessed butteroil and with a cholesterol-reduced butteroil produced by steam-stripping. EM examination of fixed material showed that emulsions produced with all formulations predominantly were of the water-in-oil type and not the oil-in-water type typical of milk lipid globules. AA

2146

Yang (B) and Parkin (KL). **Monoacylglycerol production from butteroil by glycerolysis with a gel-entrapped microbial lipase in microaqueous media.** *Journal of Food Science* 59(1); 1994; 47-52

Reaction parameters were optimized to support polyethyleneglycol-based and polypropyleneglycol-based gel-entrapped lipase-mediated glycerolysis of butteroil to yield monoacylglycerols, which, together with diacylglycerols comprise 75% of the global market for emulsifiers. Single liquid-phase reactive mixtures contained 25% (w/w) butteroil dissolved in t-butanol, to which glycerol and water were added. Optimum reaction conditions were 35-40°C and 5-10 mg enzyme reagent (lipase PS-30 from *Pseudomonas* sp.) and 0.10 g glycerol/ml substrate solution. Optimum acyl group:glycerol molar ratio was about 0.64 (range 0.30-0.70). Optimum water content was dependent on glycerol, and content was approx. 6% (w/w) of the glycerol at 0.10 g glycerol/ml substrate solution. The gel-entrapped lipases had half-lives of about 35-46 cycles of 72 h each. AA

Cheese

2147

Subramanian (A). **Renovation of old, off-flavoured cheese for processing.** *Indian Journal of Dairy Science* 47(3); 1994; 234-235

Camembert cheese

2148

Nakazawa (Y), Yamada (M), Michishita (J), Nakagawa (S) and Tsukasaki (Y). **Biochemical changes of lower molecular weight peptides during ripening of Camembert cheese.** *Indian Journal of Dairy Science* 47(3); 1994; 203-210

The degradation and distribution of lower mol. wt. peptides (LMWP) of Camembert cheese during ripening was studied. Titratable lactic acidity showed a gradual decrease, whereas pH gradually increased with increasing ripening. Various nitrogenous compound levels and

amino acids increased during ripening. The water soluble N ratio was 20.06%. Dowex 50-x-16 fraction and non-adsorbed fraction contained more N than the other fractions at 0, 7, 14 and 28 days of ripening. The formation of x-16 fraction showed increase in the LMWP with increasing ripening period. The non-adsorbed fraction contained LMWP with a PDA (degree of polymerization of amino acids) of 38-87. The quantities of oligopeptides (x-12 and x-8) fractions were lower at all ripening stages, and there was no significant difference in the proportion between the mol. wt. shapes or sizes. SRA

Cottage cheese

2149

Bautista (DA), Durisin (MD), Razavi (R-SM), Hill (AR) and Griffiths (MW). **Extending the shelf-life of Cottage cheese using monolaurin.** *Food Research International* 26 (3); 1993; 203-208

The monoglyceride monolaurin possess anti-microbial properties also acts as an emulsifying agent. Incorporation of monolaurin into naturally contaminated Cottage cheese at levels of 250 and 500 p.p.m. resulted in > 90% inhibition of both *Pseudomonas* spp. and coliforms during 7 days of storage at 6, 15 and 21°C. There was also > 90% inhibition of growth of yeasts and fungi under the same storage conditions in the presence of monolaurin. Results indicate that use of monolaurin as an emulsifying agent in Cottage cheese may have beneficial effects by extending microbial shelf-life by approx. 35% at 6°C. Monolaurin also increased shelf-life of Cottage cheese (approx. 5-10 days) when assessed by organoleptic analysis. AA

2150

Antinone (MJ), Lawless (HT), Ledford (RA) and Johnston (M). **Diacetyl as a flavor component in full fat Cottage cheese.** *Journal of Food Science* 59(1); 1994; 38-42

Diacetyl was detected at about 0.2 p.p.m. using a 2 alternative forced choice procedure. Consumer acceptance for Cottage cheese showed a small effect of added diacetyl, peaking at 1.0 p.p.m. for aroma and flavour acceptance. Patterns of acceptance across diacetyl levels were similar for both frequent and infrequent consumers. Consumer acceptance tests conducted in a campus-based sensory testing facility gave similar results to tests conducted in a shopping mall, although the mall data were more variable. AA

Desserts

2151

Adhikari (K) and Arora (KL). **Development of Mellorine type frozen desserts - Effect of stabilizers and emulsifiers.** *Indian Journal of Animal Science* 64(5); 1994; 526-533

Mellorine type frozen desserts were manufactured using groundnut-oil and *vanaspati*/ghee by standard manufacturing procedure with some modifications and compared with control ice-cream. The values of surface tension, relative viscosity melting rate and pH and sensory qualities of all types of desserts were comparable to those of control ice-cream, whereas free fat content was higher and whipping ability lower than the control. AA

Gulabjamun

2152

Prajapati (PS), Thakur (PN) and Upadhyay (KG). **Preparation of *gulabjamun* from buffalo milk *khoa*/dough incorporated with trisodium citrate.** *Indian Journal of Animal Science* 64(4); 1994; 411-413

Trisodium citrate (TC) was incorporated in varying concn. during *khoa* and dough making and its effect on quality of *gulabjamun* was studied. Composition, penetration value and springiness of *gulabjamuns* were not affected significantly by the use of TC, whereas flavour and sugar absorption characterisitcs improved significantly. Softness and sensory quality of *gulabjamun* improved with the addition 0.5% TC in milk during *khoa* making. BV

Ice cream

2153

Bharath Bhushan Reddy (B), Ranganadham (M), Reddy (VP), Kumar (S) and Kotilinga Reddy

(Y). **Studies on the quality of ice-cream sold in Tirupati town.** *Indian Journal of Dairy Science* 47(3); 1994; 215-218

This evaluation showed that 55.5% of the plain ice cream (IC) samples and 58.5% of the fruit and nut (F/N) var. of ice cream could only meet the min legal standards of PFA standards for milk solids. Not all the F/N var. of the IC contained fat as per the PFA standards while 61.1% of plain IC var. met the min standard for fat. Titratable acidity, pH, and melt-down times were within normal limits for all the var. Vanilla flavoured IC was rated the best and chocolate IC scored the least for their quality. Majority of IC lacked the characteristic flavour and had fluffy, icy and weak-bodied defects. SRA

Khoa

2154

Kumar (S) and Pal (D). **Production of *Khoa* from buffalo milk concentrated by reverse osmosis process.** *Indian Journal of Dairy Science* 47(3); 1994; 211-214

Khoa was prepared from buffalo milk conc. by reverse osmosis (RO) process and chemical, sensory and rheological qualities were compared with traditionally prepared (TP) *khoa*. The moisture content was higher and free fat content was lower in RO processed *khoa* (ROPK), and sensory qualities of ROPK and TPK were similar. TPK was more hard, springy, gummy, chewy and cohesive as compared to ROPK. The use of 1.5 fold RO conc. milk produced *khoa* of acceptable quality. SRA

Milk powders

2155

Chuy (LE) and Labuza (TP). **Caking and stickiness of dairy-based food powders as related to glass transition.** *Journal of Food Science* 59(1); 1994; 43-46

Effects of heating rate, storage temp. and a_w on surface caking (T_{sc}) and advanced caking (T_{ac}) of several dairy-based infant formula powders were determined by the modified ampule and sealed glass test tube methods, respectively. The glass transition temp., T_g, was determined by DSC. Observed T_{sc} and T_{ac} values were higher at faster scan rates (5 and $10^{\circ}C$/min) compared to a slower heating rate ($1^{\circ}C$/3 min). Because of the sample size and the difference in viscous flow time constants, T_{ac} greater than or equal to T_{sc} greater than or equal to T_g. As expected, stability towards collapse and sticking decreased with increasing amounts of low-mol. wt. carbohydrate. Predicted stable storage aw at room temp. based on T_{sc} were higher than those observed during storage; however, the a_w at which $T_{storage} = T_g$ gave a good prediction of the %RH when collapse begins. AA

Sandesh

2156

Sen (DC) and Rajorhia (GS). **Role of saffron in improving storage quality of *sandesh*.** *Indian Journal of Dairy Science* 47(3); 1994; 198-202

The effects of adding saffron (*Crocus sativus* Linnaleus) at 3 levels (0.01, 0.015 and 0.02% by wt. of chhana) on chemical, microbiological and sensory characteristics of *sandesh* (a traditional Indian milk sweet) were investigated in samples stored at 30 plus or minus $1^{\circ}C$ and at 7 plus or minus $1^{\circ}C$. The increased doses of saffron into *sandesh* slowed down the chemical and microbiological changes under both the conditions of storage. An optimum quantity of 0.015% saffron by wt. of chhana is recommended for improving the flavour and shelf-life of *sandesh*. AA

Wheys

2157

Lee (SP) and Batt (CA). **A micro-scale method for measuring the hardness of heat-induced protein gels.** *Journal of Texture Studies* 24(1); 1993; 73-79

A micro-scale penetrometry method for testing hardness of heat-induced whey protein gels was developed. The hardness of gels could be determined quantitatively on sample vol. as small as 20 µl. A needle with an outside diam. of 1.06 mm (18 gauge) weighted with a water reservoir was used to measure the force which was necessary to penetrate a gel contained

within a capillary tube. In parallel, an Instron Universal Testing Machine was used for compression testing of protein gels. There was a high correlation between the values obtained using an Instron (70% compression) and those obtained using a micro-penetrometer for bovine β-lactoglobulin gels prepared at concn. in the range 10-13%. There was a high degree of correlation for hardness measurements between methods for gels made from either whey protein isolate or bovine serum albumin. Based upon standard curves of Instron force vs. penetration force, the penetration force of whey protein gels as measured by micro-scale penetrometry could be converted into relative Instron force units. AA

Yoghurts

2158

Misra (AK) and Kulla (RK). **Use of *Bifidobacterium bifidum* for the manufacture of bio-yoghurt and fruit bio-yoghurt.** *Indian Journal of Dairy Science* 47(3); 1994; 192-197

Biograde and bifighurt products were prepared by culturing milk (16% TS) with one or both of the normal yoghurt cultures with 2% (*Streptococcus salivariaus* subsp. *thermophilus* H and *Lb. delbrueckii* subsp. *bulgaricus* W and *Bifidobacterium bifidum* or and *Lactobacillus acidophilus* in 1:1 ratio). Products were added with orange, grape, pineapple and carrot juices for palatability and were evaluated. The product with or without juices gave good flavour, firm consistency and mild acidic taste. Pineapple flavoured product ranked first followed by other fruit biograde, carrot biograde, normal biograde and bifighurt. The products did not show any anti-bacterial activity against *Escherichia coli*, *Shigella dysenteriae*, *Staph. aureus* and *Bacilllus cereus*. SRA

2159

Skriver (A), Roemer (H) and Qvist (KB). **Rheological characterization of stirred yoghurt: viscometry.** *Journal of Texture Studies* 24(2); 1993; 185-198

Rheological characteristics of stirred yoghurt, varying in DM content [0, 1 or 2%], fermentation temp. [32 or 43°C] and composition of bacteria cultures [YC-180, YC-350 and YC-470 and *Streptococcus thermophilus* Stb16 and Lactobacillus bulgaricus LB18], were evaluated using a Bohlin VOR Rheometer. Flow curves, covering the shear rate range 29-920 s^{-1}, generally indicated the presence of a yield point and pseudoplastic behaviour, but also Bingham plastic behaviour was observed for some of the samples. Systematic variations in the profile of the flow curves were observed as a result of the applied manufacturing conditions. Flow curves exhibiting pseudoplastic behaviour with a yield stress could not, over this broad shear rate interval, be described satisfactorily by the Casson or Herschel-Bulkley models, and therefore a new model, the QRS-model, was introduced. The model contains 3 parameters and gave a significantly better fit, with R^2 values generally > 0.99. AA

Milk proteins

2160

Legowo (AM), Imade (T) and Hayakawa (S). **Heat-induced gelation of the mixtures of** α-lactalbumin and β-lactoglobulin in the presence of glutathione. *Food Research International* 26 (2); 1993; 103-108

Optimum conditions for obtaining the max. gel strength upon heating mixtures of α-lactalbumin (LA) and β-lactoglobulin (LB) were investigated at different concn. of glutathione (reduced type) and NaCl. Gel strength was determined after heating at 80°C for 15 min at pH 6.3 and a protein concn. of 8%. Max. gel strengths for mixtures of α-LA and β-LG in the ratio of 2:8, 5:5, and 8:2 were obtained at glutathione and NaCl concn. of 0 and 86, 43 and 116, and 45 and 83 mM, respectively. Multiple regression analysis indicated that both glutathione and NaCl contributed significantly (P less than or equal to 0.01) to gel formation. The promotion of gel formation with glutathione was postulated to result from glutathione reacting with intramolecular disulphide bonds in the α-LA and β-LG, thereby resulting in conformational changes. It was postulated that α-LA and β-LG were interacting in the gelation of the mixed proteins. AA

2161

Zbikowska (A), Dziuba (J), Ozimek (L) and Wolfe (FH). **Manufacturing processes influence the proteolytic action of rennin on casein in several dairy products.** *Food Research International* 26 (1); 1993; 19-26

Research was undertaken to estimate the extent of change in milk proteins brought about by industrial processes that are utilized in the manufacture of skim milk powder (SMP), evaporated milk (EM), sodium caseinate (SC) and SCOP. Potentiometric titration was used to determine the differences in the accessibility of functional groups. The kinetics of release of peptides soluble in 2% (w/v) TCA and glycopeptides soluble in 12% (w/v) TCA from casein substrates by rennin were determined. Casein substrates showed a diversified susceptibility to the action of rennin. The velocity of total peptides release at pH 5.6 decreased (P less than or equal to 0.05) in the following order: reconstituted condensed milk > SCOP > SC > reconstituted SMP. Km values for total peptide release were higher (lower affinity) (P less than or equal to 0.05) in SCOP and SC than in EM and SMP. The velocity of glycopeptides release differed (P less than or equal to 0.05) for all substrates at pH 6.6. Km values for the release of glycopeptides ranged from 4.8×10^{-5} to 5.4×10^{-5}M and were lowest (P less than or equal to 0.05) in SMP at pH 6.6 and 5.6 and EM at pH 5.6. It was concluded that the susceptibility of casein to proteolysis in milk products was influenced by processing. AA

MEAT AND POULTRY

Meat

2162

Pham (QT), Fleming (AK) and Willix (J). **Thawing of meat blocks in polythene wraps and in cartons.** *International Journal of Refrigeration* 16(3); 1993; 169-174

The thawing of cartoned and plastics-wrapped meat blocks, mostly 170 mm thick, in circulating air was investigated. Results showed that the thawing of large blocks of meat is a difficult process to control. Using longer times or higher temp. than strictly necessary resulted in poor product appearance and often odour problems. Effects of wrap, product position, product thickness, air temp., humidity and air velocity on thawing time, drip loss and sensory qualities were investigated. A Plank-type equation was used to correlate thawing times, but due to the complex and changing heat transfer situation at the meat surface, the heat transfer coeff. had to be found by curve-fitting. Drip loss was lower at air velocities greater than 1 m/s. Odour and appearance were generally better at lower air temp., but could deteriorate at temp. as low as 5°C. AA

2163

Jankiewicz (L), Kwasny (M), Wasylik (K) and Graczyk (A). **Structure studies on the nitrosyl derivative of heme.** *Journal of Food Science* 59(1); 1994; 57-59

Electronic spectra were obtained on the nitrosyl derivative of haeme prepared by synthesis from haemin and sodium nitrite within the UV-region. They were compared with spectra of nitrosyl derivative of haeme dimethyl ester within the IR region. The degree of haemin reacting with NO ligand as well as the stability constant of the haeme:NO complex were calculated. Results showed that in the nitrosyl derivative of haeme 1 NO ligand was bound with 1 haeme iron of the pigment. Therefore, it seems that the cooked cured-meat pigment is a mononitrosyl derivative of haeme. AA

2164

Colmenero (JF), Careche (J), Carballo (J) and Cofrades (S). **Influence of thermal treatment on gelation of actomyosin from different myosystems.** *Journal of Food Science* 59(1); 1994; 211-215, 220

The influence of temp. and heating time on rheological properties and type of proteins involved in the gelation process of natural actomyosin (AM) from pork, chicken and hake [(*Merluccius merluccius*) were analysed]. At low temp. (40-50°C) hake gels were stiffer than chicken or pork gels (due to setting); at higher temp. (60°C), actomyosin from all 3 formed gels with similar rheological characteristics. Types of protein in the different fractions (analysed by

electrophoresis) were consonant with the rheological behaviour of the [AM] gels for each heat treatment and species. SRA

Beef

2165

Provost (CM), Whiting (RC) and Craig (JCJr). **Steam surface pasteurization of beef frankfurters.** *Journal of Food Science* 59(1); 1994; 1-5

2166

Weon (JK) and Slavik (MF). **Trisodium phosphate (TSP) treatment of beef surfaces to reduce *Escherichia coli* O157:H7 and *Salmonella typhimurium*.** *Journal of Food Science* 59(1); 1994; 20-22

Trisodium phosphate (TSP) was evaluated for removing attached *Escherichia coli*O157:H7 FSIS 45956 and *Salmonella typhimurium* ATCC 14028 from beef surfaces using microbiological plating and SEM. Both fat and fascia surfaces were exposed to 10-9 cfu/ml of each inoculum for 15 min and rinsed with 10% TSP solution (10°C) for 15 s. Compared to controls (no TSP treatment), the level of *E. coli* O157:H7 was 1.35- and 0.92-logs lower on TSP-treated fat and fascia surfaces, respectively, by plating. *S. typhimurium* was 0.91- and 0.51-logs lower, respectively. By SEM, TSP-treated fascia surfaces showed 1.39-log and 0.86-log reductions in E. coli O157:H7 and *S. typhimurium*, respectively. Overall, TSP was more effective on removing *E. coli* O157:H7 than *S. typhimurium* and more efficient in removing both bacteria from fat surfaces than from fascia. AA

2167

Miller (RK) and Acuff (GR). **Sodium lactate affects pathogens in cooked beef.** *Journal of Food Science* 59(1); 1994; 15-19

Effects of sodium lactate on *Listeria monocytogenes*, *Staphylococcus aureus*, *Salmonella typhimurium*, *Clostridium perfringens* and *Escherichia coli* O157:H7 in inoculated, precooked beef were evaluated during vacuum-packaged storage at 10°C for 0, 7, 14, 21 or 28 days. Cooked, quartered beef top rounds containing either 1, 2, 3 or 4% sodium lactate were aseptically sampled and slice sections were inoculated with *L. monocytogenes* ATCC 43256, *S. aureus* ATCC 27154, *S. typhimurium* ATCC 13311, *C. perfringens* ATCC 12924 or *E. coli* O157:H7 ATCC 43895. Three and 4% sodium lactate showed some control of *S. typhimurium*, *L. monocytogenes* and *E. coli* O157:H7 compared with control roasts (0% sodium lactate) and roasts containing 2% sodium lactate. It was concluded that 3-4% sodium lactate may be recommended to control pathogens in precooked, uncured beef roasts. AA

2168

Berry (BW). **Fat level, high temperature cooking and degree of doneness affect sensory, chemical and physical properties of beef patties.** *Journal of Food Science* 59(1); 1994; 10-14, 19

Effects of high temp. cooking to 2 visual degrees of doneness on properties of low fat beef patties were evaluated. Ground beef patties containing 4 or 20% fat were cooked by electric grill (G) alone or in combination with overhead broiler unit (BG) to be (visually) either medium or well-done. Patties with 20% fat had higher beef flavour intensity, juiciness and tenderness scores, lower Instron shear and compression values, and lower cooking yields than 4% fat patties. However, 4% fat patties cooked to medium, had similar sensory ratings to 20% fat patties cooked well-done. Approx. 20% of patties cooked to medium did not reach recommended internal temp. and holding times for food safety. AA

2169

Bullock (KB), Huffman (DL), Egbert (WR), Mikel (WB), Bradford (DD), Jones (WR). **Storage stability of low-fat ground beef made with lower value cuts of beef.** *Journal of Food Science* 59(1); 1994; 6-9

Lower value beef cuts for the manufacture of low-fat ground beef were evaluated for sensory and colour properties, raw and cooked composition, cook loss, texture and lipid oxidation. 5 combinations of low-fat ground beef treatments were prepared with lower value raw-materials: 90% lean cow trimmings, 50/50

defatted clods and rounds, cow knuckles and cow chucks. They were compared to a 20% fat control for quality attributes during 24 wk frozen (-20°C) storage. Control patties had greater ($P < 0.05$) cooking loss, shear force and connective tissue and lower ($P < 0.05$) juiciness scores than low-fat treatments. All low-fat pattie treatments were rated higher (P M 0.05) in flavour intensity than control patties. Low-fat patties manufactured with a majority of lean cow trimmings had a greater colour (pigment) and oxidative (lipid) stability. AA

2170

Ibrahim (SA) and Bezkorovainy (A). **Growth-promoting factors for *Bifidobacterium longum*.** *Journal of Food Science* 59(1); 1994; 189-191

The ability of various biological materials to promote growth of *Bifidobacterium longum* (ATCC 15708) was tested using Bacto B12 assay medium (Difco Corp.). Supplements included yeast extract, beef extract, malt extract, α-lactalbumin, β-lactoglobulin, trypticase soy broth, phytone-peptone and unknown factors from *Escherichia coli* spent broth. Growth of *B. longum* 15708 was monitored by measuring turbidity and pH. Yeast extract, α-lactalbumin and β-lactoglobulin were the best growth promoters. Growth in the presence of *E. coli* spent broth was max.; however, fresh enzymically hydrolysed *E. coli* broth was as effective. Beef extract and trypticase soy broth were effective to some extent. Malt extract and phytone-peptone did not significantly enhance growth. All materials lost growth promoting activity when their disulphide bonds were reduced-alkylated. AA

2171

Duckett (SK), Wagner (DG), Yates (LD), Dolezal (HG) and May (SG). **Effects of time on feed on beef nutrient composition.** *Journal of Animal Science* 71(8); 1993; 2079-2088

2172

Newman (S), MacNeil (MD), Reynolds (WL), Knapp (BW) and Urick (JJ). **Fixed effects in the formation of a composite line of beef cattle. II. Pre- and postweaning growth and carcass composition.** *Journal of Animal Science* 71(8); 1993; 2033-2039

Mutton

Sheep

Lamb

2173

Jeremiah (LE), Gibson (LL) and Tong (AKW). **Retail acceptability of lamb as influenced by gender and slaughter weight.** *Food Research International* 26 (2); 1993; 115-118

A retail survey was conducted to determine the retail acceptability of lamb rib chops from animals differing in gender and slaughter wt. A random array of 12 packs of untrimmed chops, with equal wt., representative of 3 genders (rams, ewes and wethers) and 4 slaughter wt. groups (40.5-49.5; 50.0-58.6; 58.9-67.7; and 68.2-76.8 kg live wt.) were presented to 2002 consumers as they passed through 31 supermarkets in 2 cities. Respondents demonstrated an obvious aversion to fatness, and > 50% of the respondents indicated chops from all genders and slaughter wt. groups were unacceptable, with the exception of chops from ram lambs up to 58.6 kg in live wt. at the time of slaughter. Therefore, the population of lambs currently being produced and marketed are too fat to be acceptable to the vast majority of Canadian consumers. AA

2174

Lee (YB) and Kim (YS). **Muscle characteristics and meat tenderness of cimaterol-fed lambs.** *Journal of Food Science* 59(1); 1994; 33-37

Shear values of loineye muscle from climaterol (CIM)-fed lambs were 32 and 28% > those of controls (non-CIM-fed lambs) at 1 and 8 days post mortem. CIM-fed animals showed lower ($P < 0.01$) cytochrome oxidase activity, lower ($P < 0.01$) initial glycogen and higher ($P < 0.05$) 24 h pH in the longissimus and semimembranosus muscles. Intramuscular fat of treated lambs (2%) was lower ($P < 0.01$) than that of controls (5.1%), whereas muscle protein

concn. was greater ($P < 0.05$). The decreased aerobic capacity, lower intramuscular fat, lower initial glycogen, higher ultimate muscle pH (5.8-6.2) with subsequently reduced post mortem proteolysis and higher protein concn. all appeared to contribute to greater meat toughness of CIM-fed lambs. AA

2175

Maiorano (G), McCormick (RJ), Field (RA) and Snowder (G). **Intramuscular collagen characteristics of ram, wether, and zeranol-implanted ram lambs.** *Journal of Animal Science* 71(7); 1993; 1817-1822

Pork

2176

Tae (KK), Murano (EA) and Olson (DG). **Heating and storage conditions affect survival and recovery of *Listeria monocytogenes* in ground pork.** *Journal of Food Science* 59(1); 1994; 30-32, 59

Effects of heating rate, packaging atmosphere and meat age on survival of *Listeria monocytogenes* were examined in ground pork (pork mince), as well as the ability of injured cells to recover during storage under air and vacuum packaging at 4 and 30°C. Significantly more survivors were observed when samples were heated at 1.3°C/min than at 8.0°C/min. Cells inoculated into 3-month-old pork were more sensitive to heating than cells inoculated into fresh ground pork ($D62°C$ = 5.2 and 7.7 min, respectively). More survivors were detected when meat was heated aerobically than anaerobically. However, storage under vacuum at 4 or 30°C resulted in faster recovery compared with cells packaged in air. Thus, heating and packaging conditions affected ability of this pathogen to survive and recover after a heat process in pork. AA

2177

Apgar (GA), Kornegay (ET), Lindemann (MD) and Wood (CM). **The effect of feeding various levels of *Bifidobacterium globosum* A on the performance, gastrointestinal measurements, and immunity of weanling pigs and on the performance and carcass measurements of growing-finishing pigs.** *Journal of Animal Science* 71(8); 1993; 2173-2179

2178

Hansen (BC) and Lewis (AJ). **Effects of dietary protein concentration (corn:soybean meal ratio) on the performance and carcass characteristics of growing boars, barrows, and gilts: mathematical descriptions.** *Journal of Animal Science* 71(8); 1993; 2122-2132

2179

Kramer (SA), Bergen (WG), Grant (AL) and Merkel (RA). **Fatty acid profiles, lipgenesis, and lipolysis in lipid depots in finishing pigs treated with recombinant porcine somatotropin.** *Journal of Animal Science* 71(8); 1993; 2066-2072

2180

Spurlock (ME), Cusumano (JC) and Mills (SE). **The affinity of ractopamine, clenbuterol, and L-644,969 for the β-adrenergic receptor population in porcine adipose tissue and skeletal muscle membrane.** *Journal of Animal Science* 71(8); 1993; 2061-2065

2181

Hovenier (R), Kanis (E) and Verhoeven (JAM). **Repeatability of taste panel tenderness scores and their relationships to objective pig meat quality traits.** *Journal of Animal Science* 71(8); 1993; 2018-2025

2182

Mikel (WB), Althen (TG), Rogers (RW), Moore (AB), Miller (HW), Miller (LF). **Effects of exogenous porcine somatotropin on the carcass composition, hormonal and metabolic profiles, lipogenic capacity, and binding of insulin to erythrocyte receptors of fast- versus slow-growing swine.** *Journal of Animal Science* 71(7); 1993; 1786-1795

2183

Seve (B), Ballevre (O), Ganier (P), Noblet (J), Prugnaud (J), Obled (C). **Recombinant porcine somatotropin and dietary protein enhance protein synthesis in growing pigs.** *Journal of Nutrition* 123(3); 1993; 529-540

The effects of a daily porcine somatotropin (PST) injection on protein synthesis rate in muscle (longissimus), liver and intestine, as influenced by dietary protein, were investigated in 17 pigs. Positive responses of wt. gain and N balance were observed, primarily at higher dietary protein intake, after PST treatment. PST-treated pigs had a higher proportion of muscle and less fat. Fractional protein synthesis rate was 16% higher in the liver of PST treated pigs ($P < 0.05$). In the longissimus muscle fractional protein synthesis rate increased with PST dose from 3.2 to 3.7%/day and from 4.1 to 5.1%/day at low and high protein intake, respectively ($P < 0.05$). The effect of dietary protein on fractional protein synthesis rate in longissimus was significant, but there was no PST x protein interaction. RNA concn. followed the same pattern as fractional protein synthesis rate in liver and longissimus. In duodenal tissue, PST treatment depressed fractional protein synthesis rate ($P < 0.05$) without an effect of dietary protein and RNA concn. did not change. In PST compared with placebo-treated pigs, plasma glucose, insulin and insulin-like growth factor-I concn. were elevated whereas plasma thyroxine was depressed and plasma triiodothyronine remained constant. There was no clear effect of dietary protein on plasma hormones. Results indicated that, in swine fed an adequate level of protein, PST stimulated protein synthesis in the liver and muscle, primarily through increased ribosomal capacity. AA

Meat

2184

Gordon (A). **Studying comminuted meat products using corroborative techniques.** *Food Research International* 26 (3); 1993; 209-216

Discusses the techniques used to study interactions in comminuted meat products which relate to their stability, texture and sensory products. These include: microstructural techniques; rheological techniques; DSC; and proteins extraction and quantitation. Application of these technologies may provide important data for manufacture of high quality consumer-acceptable products. Review. 83 references. BV

Poultry

2185

Zeitoun (AAM), Debevere (JM) and Mossel (DAA). **Significance of *Enterobacteriaceae* as index organisms for hygiene on fresh untreated poultry, poultry treated with lactic acid and poultry stored in a modified atmosphere.** *Food Microbiology* 11(2); 1994; 169-176

The significance of colony counts of *Enterobacteriaceae* on poultry, made at 37 and 42°C and of *Escherichia coli*, as indicators of hygiene following swtorage at 6 C was investigated. The enumeration of enterobacteriaceae from plates incubated at 37 and 42 C indicated the hygienic condition of freshly processed items but not of those stored at 6 C. Enumeration of *E. coli* constitutes the most realistic means of defining the hygienic condition of poultry after storage at 6 C, and found to be good indicator of temp. abuse during storage. Lactic acid decontamination (10% w/v) by the buffered system produced a significant elimination of all *Enterobacteriaceae* as an immediate effect, followed by a marked inhibitory effect on the psychrotropic component of this group when the product was stored at 6 C. SRA

2186

Bailey (JS). **Control of *Salmonella* and *Campylobacter* in poultry production. A summary of work at Russell Research Centre.** *Poultry Science* 72(6); 1993; 1169-1173

A multifaceted research approach to control pathogenic bacteria such as *Salmonella* and *Campylobacter* in poultry production is discussed in this article. Aspects considered include; sources of contamination (chicks, feed, insects, transport, processing); susceptibility of chickens to colonization; critical control points; competitive exclusion (introduction of competitive microflora in chicken gastrointestinal tract); use of chemicals to disinfect hatching eggs; sanitation in hatcheries; host response to bacterial infection; and genetic susceptibility of chickens to infection. CSA

Chickens

2187

Reddy (PK) and Reddy (VR). **Quality of refrigerated cockerel meat as influenced by chemical treatments.** *Indian Journal of Animal Science* 64(1); 1994; 71-74

Forty ready-to-cook cockerel halves were evaluated for quality after subjecting them to differnt treatments, viz., chilling in 3% sodium tripolyphosphate (STPP), 3% NaCl, STPP 1.5% + NaCl 1.5%, 0.5% acetic acid and slushed ice. Carcasses treated with 3% STPP resulted in highest moisture uptake and less cooking losses on storage. Chilling in 3% STPP resulted in higher meat pH, lower ERV and TBA values on the first day but acetic acid (0.5%) treatment gave least meat pH. Under refrigerated storage (5 plus or minus 1 C) for 5 days STPP 3% treatments significantly reduced the cooking losses and TBA values, whereas 0.5% acetic acid and 3% NaCl treatments significantly increased ERV and TBA values. Refrigerated storage (5 days) yielded higher organoleptic scores with STPP 3% followed by NaCl 3% treatment. Treatment with acetic acid (0.5%) followed by STPP + NaCl combination gave lesser scores on storage. AA

2188

Ang (CYW) and Huang (YW). **Color changes of chicken leg patties due to end-point temperature, packaging and refrigerated storage.** *Journal of Food Science* 59(1); 1994; 26-29

Patties of broiler leg muscle were heated to end point temperatures (EPT) of 60, 65, 70, 75, 80 or 85°C, packaged in polyethylene bags or vacuum skin packs and stored at 4°C for up to 14 days. As EPT increased, lightness ('L') and yellowness ('b') increased whereas redness ('a') decreased. Patty top surface centre colour 'L' and 'a' values correlated highly with the interior cut surface values. Patties stored in plastic zipper bags tended to show a lower 'b' ($P < 0.05$) reading than patties stored in vacuum skin packs and plastic film. Storage for 2 wk at 4°C increased 'L' and decreased 'a' and 'b' for all patties. As EPT increased, the colour difference (ΔE) at the interior cut surface of patties heated to lower EPT and those heated to 85°C were reduced. AA

2189

Yanbin Li, Weon (JK), Slavik (MF), Griffis (CL), Walker (JT), Hong (W). ***Salmonella typhimurium* attached to chicken skin reduced using electrical stimulation and inorganic salts.** *Journal of Food Science* 59(1); 1994; 23-25, 29

Chicken skins inoculated with *Sal. typhimurium* ATCC 14028 at 1 x 10^8 cfu/ml were subjected to chemical or electrical treatments (4 mA/cm^2 current, 1 kHz frequency and 50% duty cycle) for 10 min in 1% NaCl, Na_2CO_3 or trisodium phosphate ($Na_3PO_4.12H_2O$, or TSP). *Sal. typhimurium* attached to skins were reduced by 90% after electrical treatments in 1% NaCl, Na_2CO_3 or TSP, while the reduction ranged from 34 to 76% in groups treated by the salts alone. SRA

2190

Taylor (BG), Glass (KA), Luchansky (JB) and Maurer (AJ). **Fate of *Listeria monocytogenes* and pediococcal starter cultures during the manufacture of chicken summer sausage.** *Poultry Science* 72(9); 1993; 1772-1778

Two formulations of chicken summer sausage (100% hand-deboned chicken meat (HDCM) and 85% HDCM + 15% chicken heart meat) were prepared with added nonpediocin-producing (PED-) *Pediococcus acidilactici* starter and inoculated with 10^4 or 10^7 cfu of a 5-strain mixture of *Listeria monocytogenes*/g of batter. Sausages were fermented to pH 5, cooked to an internal temp. of 66.5°C, cold-showered, and stored at 4°C (60 days) and 30°C (7 days). For both formulations and inoculation levels, *L. monocytogenes* populations decreased by 1.3-1.8 $\log_{10}$ cfu/g by the end of fermentation. No *L. monocytogenes* was recovered from sausages following the cook and shower or storage at 4 or 30°C. In contrast, *P. acidilactici* increased by 0.7-1.2 $\log_{10}$ cfu/g during fermentation, and less than 10^2 cfu/g remained after the cook and shower and storage at 4 and 30°C. In a second set of experiments, sausages were prepared with a PED- or PED+ starter and challenged with the *L. monocytogenes* mixture (10^7 cfu/g).

The PED- culture reduced numbers of *L. monocytogenes* by 1.2 log_{10} cfu/g during fermentation, whereas *L. monocytogenes* numbers declined 2.6 log_{10} cfu/g in the presence of the PED+ culture. Although acid production by both starter cultures was equivalent, greater inhibition of *L. monocytogenes* by the PED+ compared to the PED- starter was attributed to in situ production of pediocin. Pediococcal starters and proper cooking eliminated *L. monocytogenes* from sausages and established that PED+ cultures provide an additional hurdle against poultry-related listeriosis. AA

2191

Dawson (PL) and Sheldon (BW). **Pretreatment effects on the texture and integrity of aseptically processed chicken meat particulates.** *Poultry Science* 72(5); 1993; 968-978

The effect of presoaking and freezing of uncooked spent chicken breast meat prior to aseptic processing on yield, texture, water holding capacity and volatile profile of meat strips were investigated. Meat strips were submerged for 15 h in a solution of 3.0% salt, 0.3% sodium polyphosphate, 2% sorbitol and 2% sucrose, frozen, and heated in an HTST aseptic processor utilizing an aqueous heat exchange medium containing 1.5% salt. The salt and sugar presoak treatment reduced Kramer shear values by 36.5%, which agreed with the texture profile results. Freezing meat strips prior to heat processing helped to maintain meat integrity throughout aseptic processing. Although textural quality losses due to aseptic processing were minimized by presoaking in salts and sugars, losses in meat moisture content and tenderness were detected throughout 49 days of refrigerated storage. Compared to the water-soaking treatment, lower concn. of lipid autoxidation products were initially detected in breast strips soaked in the salt and sugar sol. Results indicate that the observed toughening effect, previously detected in aseptically processed chicken meat, can be reduced by presoaking the meat in a salt and sugar sol. prior to aseptic processing. Meat particle integrity can be maintained by aseptic processing of frozen meat. AA

2192

Hollender (R), Bender (FG), Jenkins (RK) and Black (CL). **Consumer evaluation of chicken treated with a trisodium phosphate application during processing.** *Poultry Science* 72(4); 1993; 755-759

Effects of treating fresh broiler carcasses with trisodium phosphate (used to reduce incidence of *Salmonella*) on taste, texture and appearance were investigated by consumer evaluation. Flavour and texture scores were not significantly different for treated and control samples of fried or baked thigh and breast. Appearance of carcasses was similar whether treated immediately or stored for 5 days prior to treatment. Consumer preference for treated carcasses was not significant on day 1 (when carcasses were fresh), but was significant 8 days after treatment. AA

2193

James (WO), Prucha (JC) and Brewer (RL). **Cost-effective techniques to control human enteropathogens on fresh poultry.** *Poultry Science* 72(6); 1993; 1174-1176

Cost-effective techniques for control of human enteropathogens (*Salmonella*) on fresh poultry are discussed. Aspects considered include: process control, from hatchery to processing plant; projects to assess microbiological control techniques (the Puerto Rico bacterial control project); and effective methods of reducing *Salmonella* on poultry products (scalding and rinsing of poultry, chlorinated chiller water). The results show that a combination of the above aspects can bring about significant improvements in the bacterial quality of fresh poultry. CSA

Broilers

2194

Sams (AR) and Mills (KA). **The effect of feed withdrawal duration on the responsiveness of broiler pectoralis to rigor mortis acceleration.** *Poultry Science* 72(9); 1993; 1789-1796

This experiment was conducted to examine the effects of duration of preslaughter feed withdrawal on tenderness and post mortem metabolism of breast meat from broiler

carcasses receiving treatments that accelerate rigor mortis. Rigor mortis was accelerated by combining electrical stimulation and high temp. conditioning immediately post mortem. At 1 h post mortem, one breast fillet from each carcass was removed, frozen and analysed for metabolic and structural properties. The other fillet was excised, aged for 23 h, cooked and sheared. As duration of feed withdrawal increased, muscle glycogen decreased. Shear value and pH decreases were most pronounced after 5 h of feed withdrawal. The feed withdrawal period did not affect R value, fragmentation index, or sarcomere length. Rigor mortis acceleration resulted in longer sarcomeres and increases in R value and fragmentation index. AA

2195

Blankenship (LC), Bailey (JS), Cox (NA), Stern (NJ), Brewer (R), Williams (O). **Two-step mucosal competitive exclusion flora treatment to diminish salmonellae in commercial broiler chickens.** *Poultry Science* 72(9); 1993; 1667-1672

There is a need to control the intestinal colonization of broiler chickens by salmonellae in order to reduce the contamination of poultry meat products. A 2-step treatment of broiler chicks with a mucosal competitive exclusion culture (MCE) was tested, in which MCE was first sprayed on chicks in the hatchery followed by administration in the first drinking water. 3 commercial flocks were treated and compared with parallel, untreated control flocks. Environmental, hatchery, skin with feathers, and caecal samples were analysed at 3 and 7 wk for the presence of salmonellae. Carcass rinse samples of fully processed birds were analysed similarly. The results showed that initial food, water and litter contamination was at a low frequency < 10%. After 3 wk growth, contamination of litter, skin with feathers, and caeca were significantly ($P < 0.05$) reduced in treated flocks as compared with control flocks. Salmonellae prevalence in caeca and processed carcass rinses was also significantly ($P < 0.05$) reduced from 41% in control flocks to 10% in treated flocks. It is concluded that treatment of chickens in a commercial setting with MCE cultures can serve as a useful means to reduce salmonellae contamination. AA

2196

Walker (JM), Buhr (RJ) and Fletcher (DL **Investigation of processing factor contributing to hemorrhagic leg syndrom in broilers.** *Poultry Science* 72(8); 199 1592-1596

Broiler processing trials were conducted determined effects of dark-conditionin electrical stunning, picking and femoral ve flushing on occurrence of HLS. Broilers we processed using: dark-conditioning for 10 mi stunning and killing in the dark; electric stunning with 100 V alternating current for s; picking for 30 s in a rotary drum picker; an flushing the femoral vein with saline. Aft chilling, broiler legs were scored subjectively (2 or 3) for the presence and severity of HL Scoring was based on a 3 point scale with 1 no apparent HLS, 2 = moderate HLS and 3 severe HLS. Results indicated tha dark-conditioning, drum picking and flushin did not significantly ($P > 0.05$) increase decrease incidence or severity of HLS. Electric stunning consistently resulted in significant ($P < 0.05$) higher incidence and severity of HL Flushing the femoral vein reduced surfac blood splash at the proximal end of the femu and resulted in less blood retention in th femoral vein. AA

2197

Lyon (CE) and Dickens (JA). **Effects of electri treatments and wing restraints on the rat of post-mortem biochemical changes an objective texture of broiler *Pectoralis majo* muscles deboned after chilling.** *Poultr Science* 72(8); 1993; 1577-1583

The study was conducted to determine th effects of electric current and wing restraint on rate of post mortem biochemical change and objective texture of broiler *Pectoralis majo* meat deboned after chilling. Electri treatments (stun, stun and stimulate, an electrocution) were administered to 12 birds i each of 6 replications. In each replication, win restraints were applied to 2 of the 4 bird subjected to each electric treatment. Birds wer subjected to the stunning and electrocutio treatments prior to bleeding for 90 s. For th stun and stimulation treatment, the birds wer bled during and after pulsed stimulation Carcasses were subjected to wing restraint

after feather removal, then eviscerated, prechilled and chilled. The *Pectoralis major* meat was removed 75 min post mortem and evaluated for pH, R value (ratio of adenosine to inosine nucleotides) and sarcomere length. Meat was held at 2°C for 24 h prior to cooking and objective texture evaluation. Stunning and stimulation treatments resulted in significantly higher R values and lower pH values compared with the electrocution treatment. Application of wing restraints significantly increased sarcomere length in raw deboned meat. Stunning followed by pulsed stimulation in conjunction with wing restraints resulted in the lowest shear values (5.95 kG) for cooked meat that had been deboned 75 min post mortem. AA

2198

Waldroup (AL), Skinner (JT), Hierholzer (RE) and Waldroup (PW). **An evaluation of fructooligosaccharide in diets for broiler chickens and effects on salmonellae contamination of carcasses.** *Poultry Science* 72(4); 1993; 643-650

Effects of fructooligosaccharide (FOS) addition to broiler diets on carcass composition and *Salmonella* contamination of carcasses were investigated. FOS was fed at 0 and 0.375% of the diet, with bacitracin methylene disalicylate (BMD) added at 0 and 55 mg/kg for 49 days. Dressing %, abdominal fat content and MPN of salmonellae on prechill carcasses were determined. There were no significant effects of FOS or BMD on dressing % or fat content of broiler carcasses. When FOS or BMD were used separately, there was a significant reduction in MPN of salmonellae in rinse fluid of prechill carcasses. However, when FOS and BMD were used in combination, MPN of salmonellae in rinse fluid was similar to that for control carcasses. Antagonism between FOS and BMD is suggested. AA

2199

Waldroup (AL). **Summary of work to control pathogens in poultry processing.** *Poultry Science* 72(6); 1993; 1177-1179

Efficiency of modifications to processing techniques for reducing pathogens in poultry is discussed. 5 commercial broiler processing plants participated in the study. Broiler carcasses from each plant were analysed for *Escherichia coli*, *Listeria monocytogenes*, *Campylobacter jejuni* and *C. coli*. Processing modifications used included: counter current scalding; washing at exit from scalder; addition of 20 p.p.m. chlorine to on-line bird wash; addition of 20 p.p.m. chlorine to water used on transfer belt; 20 p.p.m. chlorine in final carcass wash; and addition of chlorine to chill water. Significant reductions in aerobic plate counts were obtained for all processing plants on post-chill broilers. No significant increase in bacterial counts were found. Effects of feed additives (propionic, citric, lactic and fumaric acids; sodium lactate and calcium formate; and lactose, D-mannose and fructooligosaccharides) on control of pathogenic microorganisms are also considered. AA

Turkeys

2200

Barbut (S). **Colour measurements for evaluating the pale soft exudative (PSE) occurrence in turkey meat.** *Food Research International* 26 (1); 1993; 39-43

The CIELAB colour measuring system was used to measure the colour of turkey breast meat from young toms, ranging from very light to very dark in colour. Lighter samples exhibited lower pH, lower gel strength and higher cooking loss compared to darker samples. The 'L' value (lightness) was significantly correlated with pH of the intact (r = -0.71, P less than or equal to 0.01) and chopped muscle (r = -0.66), cooked gel strength (r = -0.84) and cooking loss (r = 0.87). Results indicate that a type of PSE condition may exist in turkey breast meat from young toms and that such meat can be identified by a fast and non-destructive colour evaluation. AA

2201

Lilburn (MS) and Emmerson (D). **The influence of differences in dietary amino acids during the early growing period on growth and development of Nicholas and British United Turkey toms.** *Poultry Science* 72(9); 1993; 1722-1730

Effects of differences in dietary amino acids during the early growing period on properties of Nicholas (NIC) and British United Turkey (BUT) toms were investigated. From 0 to 4, 4 to 8 and 8 to 12 wk of age, NIC and BUT toms were fed one of 2 series of experimental diets. The first series was formulated to 1984 NRC specifications whereas the 2nd series contained higher concn. of lysine and total sulphur amino acids (NRC+). At 12 wk, BUT toms had significantly more carcass protein and less carcass lipid compared with NIC toms, but there were no significant dietary effects on these variables. In both strains, the NRC+ diets significantly increased the relative wt. of the eviscerated carcass and both the absolute and relative wt. of the pectoralis major muscles at 12 wk. At 20 wk, the absolute and relative wt. of the pectoralis minor muscles was significantly heavier in BUT toms and in toms fed the NRC+ diet. The tibia and femur were longer in BUT toms compared with NIC toms. AA

2202

Barbut (S) and Mittal (GS). **Effects of pH on physical properties of white and dark turkey meat.** *Poultry Science* 72(8); 1993; 1557-1565

The effects of pH (4.5, 5.5, 5.8, 6.5 and 7.5) on the rheological, gelation and water retention properties of breast and thigh turkey meat were investigated. Raw breast meat at pH 4.5 exhibited the greatest pseudoplasticity, at pH 5.8 it was similar to the thigh meat, and at pH 7.5 it was higher than thigh meat. The max. modulus of rigidity (G) of the thigh meat at its original pH (6.5) was significantly higher than for breast meat at its original pH (5.8). Increasing the breast meat pH to 6.5 resulted in G values similar to those of thigh meat. The same trend was observed for water retention ability in the raw and cooked state. Overall, water retention significantly increased with an increase in pH up to 6.5 for both the breast and thigh meat. AA

Products

Eggs

2203

Ibarz (A). **Rheology of salted egg yolk.** *Journal of Texture Studies* 24(1); 1993; 63-71

The influence of salt content (7-14% of wt.) on the rheological behaviour of egg yolk (EY) in the temp. range 5-60°C was studied. The samples showed rheological behaviour that may be described by the power law equation. An increase in salt content leads to an increase in the consistency index, whereas the flow behaviour index tends to decrease. The effect of temp. on the consistency may be related by an Arrhenius-type equation in which the activation energy decreases as the salt content increases. The behaviour index does not vary greatly with temp. and there is a linear relation with the total solids content. A general equation describing the behaviour of EY for the ranges of dry extract, salt content and temp. studied is presented $0 = 1.347 \times 10^{-19} \exp(3929/T + 0.303\ C + 0.665D)\ (r^{2.986-0.9199\ C-0.0480})$. BV

2204

Conrad (KM), Mast (MG) and MacNeil (JH). **Effect of vacuum evaporation of liquid egg white on foaming properties.** *Poultry Science* 72(9); 1993; 1779-1788

Liquid egg white was concentrated under vacuum (4.7 kPa) and at various water-jacket temp. and processing times to 13.8-21.8% solids. One half of the conc. samples were frozen, and the other half were treated with SLS or guar gum. Higher water jacket temp. increased consumer acceptance of angel cakes made with the conc. egg whites. Longer processing times and freezing of the concentrates resulted in longer whipping times and reduced cake vol. Addition of SLS reduced whipping time and increased cake vol. Foam stability decreased with higher water jacket temp. and longer processing times; however, addition of guar gum improved foam stability. Results of electrophoretic studies indicate possible damage to globulins A1 and A2. AA

2205

Gast (RK). **Evaluation of direct plating for detecting *Salmonella enteritidis* in pools of egg contents.** *Poultry Science* 72(8); 1993; 1611-1614

The effectiveness of direct plating of incubated egg contents pools onto selective agar media for detecting contamination by *Salmonella enteritidis* was evaluated and compared to several broth enrichment strategies. Pools of mixed liquid whole egg were inoculated with very small numbers of *Sal. enteritidis* cells, incubated for 4 days at 25°C, and sampled by direct plating or broth enrichment culture. Methods involving broth nonselective (pre-enrichment) and selective broth culture steps detected a significantly higher % of contaminated egg pools than direct plating, but they required 48 h longer to provide results. Methods involving direct selective broth enrichment, without prior pre-enrichment, did not perform significantly better than direct plating. Direct plating appears to provide a relatively rapid and inexpensive method for detecting *Sal. enteritidis* in bulk liquid egg, although greater sensitivity is attainable with more intensive methods. AA

2206

Bartlett (FM), Laird (JM), Addison (CL) and McKellar (RC). **The analysis of egg wash water for the rapid assessment of microbiological quality.** *Poultry Science* 72(8); 1993; 1584-1591

A total of 101 egg wash water samples from 5 different egg grading stations in eastern Ontario, Canada, were analysed for a variety of physical and chemical variables in an attempt to find a correlation with total bacterial counts. Temp., pH, total chlorine and % transmission at 600 nm (%T) were found to be significant variables; a multiple regression equation was derived that accounted for 65% of the total variation. The equation was used to classify wash water samples as acceptable (less than or equal to 10^5 cfu/ml) or unacceptable and correctly classified 77.2% of the samples. Classification of a second data (validation) set for 58 wash water samples was correctly predicted in 72% of cases. The predictive value of the equation was especially good for those wash water samples obtained from stations that had used a chlorinated alkaline detergent, 90.4 and 100% for the modelling and validation data, respectively. Maintenance of wash water at recommended levels for temp. and pH was insufficient to ensure bacterial numbers would be less than or equal to 10^5 cfu/ml. Under normal operating conditions, a min. total available chlorine concn. of 0.45 mg/l should be maintained in wash water to ensure the bacterial numbers are kept at an acceptable level. Monitoring of temp., pH, total chlorine and %T will assist in maintaining wash water quality and minimize the number of samples returned to laboratories for microbiological analysis. AA

2207

Beyer (RS) and Jensen (LS). **Tissue and egg cholesterol concentrations of laying hens fed high-protein barley flour, α-tocotrienol, and cholesterol.** *Poultry Science* 72(7); 1993; 1339-1348

The effect of high-protein barley flour (HPBF), cholesterol and α-tocotrienol on cholesterol levels of resulting eggs of laying hens was investigated. Laying hens were fed a basal diet with 0, 5 or 10% HPBF in the presence or absence of 1% cholesterol for 8 wk. In a second experiment, laying hens were fed diets with 0, 10 or 20% added HPBF (plus/minus 1% cholesterol). In a final experiment, α-tocotrienol was incorporated into a basal diet at 0, 20 or 200 p.p.m. and fed to laying hens for 6 wk. Egg cholesterol concn. were determined biweekly. Inclusion of HPBF in the diets did not significantly influence plasma or egg cholesterol concn. However, when fed in the presence of 1% cholesterol, HPBF significantly ($P < 0.01$) elevated cholesterol concn. in eggs when compared to those from hens fed the basal diet supplemented only with cholesterol. Feeding the basal diet supplemented with 0, 20 or 200 p.p.m. α-tocotrienol to laying hens failed to alter egg cholesterol levels. CSA

Wastes

2208

Shih (JCH). **Recent development in poultry waste digestion and feather utilization - a review.** *Poultry Science* 72(9); 1993; 1617-1620

The intensive and large-scale production of food animals and animal products has generated an enormous disposal problem for the animal industry. These wastes, which include animal excreta, mortalities, hair, feathers and processing wastes, are convertible

to useful resources. An efficient thermophilic anaerobic digester system that converts animal manure to methane for an energy source, solid residues for feed supplements, and liquid nutrients for aquaculture are reviewed. Properties of a feather-degrading bacterium, *Bacillus licheniformis* strain PWD-1, are also described. The bacterium can ferment and convert feathers to feather lysate, a digestible protein source for feed use. An enzyme, keratinase, secreted by this bacterium, was purified and characterized. The keratinase is a potent protease that hydrolyses all protein tested, including collagen, elastin and feather keratin. CSA

SEAFOODS

2209

Bhakuni (DS). **Bioactive metabolites of the marine invertebrates - molluscs, echinoderms, tunicates and crustaceans. Part II.** *Journal of Scientific and Industrial Research* 53(5); 1994; 340-353

Chemistry and biological activities of the secondary metabolites of molluscs, echinoderms, tunicates and crustaceans are reviewed. The status of the bioactive substances of marine invertebrates of Andaman and the Nicobar islands are included separately. Bioactive metabolites isolated from sponges, corals, gorgonians and starfish since 1990 are also detailed. 167 references. KAR

2210

Poole (SE), Mitchell (GE) and Mayze (JL). **Low dose irradiation affects microbiological and sensory quality of sub-tropical seafood.** *Journal of Food Science* 59(1); 1994; 85-87, 105

Sweetlip (*Lethrinus miniatus*), red emperor (*Lutjanus sebae*), mackerel (*Scomberomorus commerson*), whiting (*Sillago ciliata*), mullet (*Mugil cephalus*), barramundi (*Lates calcarifer*), sand crab (*Portunus pelagicus*), Moreton Bay prawns (*Metapenaeus* spp.) and king prawns (*Penaeus plubujus*) were irradiated at doses of 0, 1, 3 and 5 kGy. A dose of 1 kGy resulted in a 1.5 to 4 log reduction in total bacterial numbers. Sensory quality decreased with increasing radiation dose, but most sea foods remained acceptable after irradiation with 5 kGy. Moreton Bay and cooked king prawns, which had low initial flavour and odour scores, were acceptable after irradiation at 1 and 3 kGy, but unacceptable after irradiation at 5 kGy. The improvement in sensory properties at 1 and 3 kGy may be due to destruction of metabisulphite. Results suggest that optimal dose for species studied was between 1-3 kGy. SRA

Crab

2211

Kim (HR), Baek (HH), Meyers (SP), Cadwallader (KR) and Godber (JS). **Crayfish hepatopancreatic extract improves flavor extractability from a crab processing by-product.** *Journal of Food Science* 59(1); 1994; 91-96

Incorporation of crayfish hepatopancreatic extract (CHE) improved extraction of volatile flavour compounds and increased the extractability of nonvolatile nitrogen compounds from crab hard tissue (CHT) obtained by mechanical separation of composite crab processing by-product (primarily shell, viscera and legs). Optimum reaction conditions for hydrolysis of CHT protein were 2 h reaction with 1 ml CHE/10 g CHT at 45°C. Concn. of volatile flavour compounds increased significantly in CHE-treated CHT compared with those from untreated substrate; however, dienals and aromatic hydrocarbons decreased. Pyrazines, especially 2-ethyl-6-methylpyrazine and 2,3-dimethylpyrazine, were in markedly higher concn. due to CHE treatment. Results indicated that CHT processing by-product may be useful as a crab flavouring agent after hydrolysis of CHT by CHE. SRA

Squids

2212

Nagashima (Y), Ebina (H), Tanaka (M) and Taguchi (T). **Effect of high hydrostatic pressure on the thermal gelation of squid mantle meat.** *Food Research International* 26 (2); 1993; 119-123

High pressure treatment (HPT) was applied to squid meat paste in order to improve its lower

thermal gelation ability. The meat pastes were compressed at up to 1000 MPa for 20 min with hydrostatic pressure and then heated in 2 ways: at 90°C for 30 min (1-step heating); or at 35°C for 30 min, followed by 90°C for 30 min (2-step heating). Breaking strength value of the gel formed by the pressure (400 MPa)-1-step heating treatment was twice as high as that of the thermally induced gel. The value of the gel formed by 2-step heating was considerably lower than that formed by 1-step heating. The deterioration of gels with 2-step heating was completely suppressed by pressurization at 800 MPa for 20 min prior to heating. Pressure treatment at > 800 MPa could inactivate proteinase(s) involved in proteolysis of squid mantle muscle protein. Results indicate that HPT before heating was effective in inducing thermal gelation of squid meat. AA

Fish

2213

Karakoltsidis (PA), Vosniakos (FK), Giouvanoudi (A), Kalfa (A) and Moumtzis (A). **Biological effects of 137 Cs uptake in carp (*Cyprinus carpio* L.) and eel (*Anguilla anguilla* L.) a comparative study.** *Dairy, Food and Environmental Sanitation* 13(12); 1993; 712-713

This study indicated that the concn. of 137 Cs in the muscular tissues was greater in the *C. carpio* L. and lesser in the *A. anguilla* L. The accumulation was progressive for both species for a period of 6 months. The presence of 137 Cs in muscular tissues, livers, kidneys and gills caused a gradual degeneration. Tests concluded that allergic or toxic effects of 137 Cs caused liver hyperaemia, hemorrhages in musculature fibers and focal degeneration of epithelial cells of the renal tubules. SRA

2214

MacDonald (GA) and Lanier (TC). **Actomyosin stabilization to freeze-thaw and heat denaturation by lactate salts.** *Journal of Food Science* 59(1); 1994; 101-105

Stabilization of fish actomyosin (AM) was investigated with respect to freeze- and heat-induced denaturation as affected by concn. of sodium lactate (SL), lithium lactate and sucrose. Recovered Ca^{2+} ATPase activity was used as a measure of denaturation. Optimum cryoprotection was gained with 6% (w/v) SL. However, SL of similar quality from another source destabilized AM at low concn. and was less effective at higher concn. Lithium lactate was not an effective cryoprotectant. For heat stabilization, SL was 2 times more effective than sucrose, with an optimum concn. of 25%. SL appears to have good potential as a cryoprotectant and stabilizer of AM. AA

2215

Ishizaki (S), Loon (WL), Tanaka (M), Taguchi (T) and Amano (K). **Fish myosin fragments solubility and ANS-fluorescence intensity affected by n-butanol.** *Journal of Food Science* 59(1); 1994; 97-100, 114

Changes in the solubility and 8-anilino-1-napthalene sulphonate (ANS)-fluorescence intensity of oval filefish [*Navodon modestus*], tilapia [*Tilapia nilotica*] and black marlin [*Makaira mazara*] myosins and their fragments (rods and myosin subfragment 1, S-1) by n-butanol were examined in connection with myosin gel-forming abilities. The thermal gel-forming abilities of myosins were greatly enhanced by the addition of 0.3-0.8M n-butanol. KCl concn.-solubility curves revealed that after n-butanol addition a marked decrease in solubility was observed for myosins and S-1 whereas there was a slight decrease for rods. The fluorescence intensity of myosin-ANS in the presence of n-butanol increased markedly by heating at 30 and 35°C. A similar increase in fluorescence intensity occurred in al S-1-ANS, but not in rods. AA

2216

Kolakowska (A) and Szczygielski (M) **Stabilization of lipids in minced fish b freeze texturization.** *Journal of Food Scienc* 59(1); 1994; 88-90

Minced meats of Baltic cod (*Gadus morhu* with added krill (*Euphausia superba* D.), kri precipitate, or bream (*Abramis brama*) wer freeze-textured or frozen conventionally. Lipi composition and oxidation were analysed afte 6-8 months storage at -20°C. Analyse included peroxide value, fluorescence, lip

classes (TLC) and fatty acid composition (GC). Peroxide value was 4-9x lower in freeze-textured meat minces than in conventionally frozen samples. Docosahexaenoic acid was higher (by 22% in bream minces and 80% in cod minces without additives) in all freeze-textured minces than in conventionally frozen samples. Texturization could reduce lipid oxidation in minced fish during frozen storage. AA

Bass

2217

Fowler (KP), Karahadian (C), Greenberg (NJ) and Harrell (RM). **Composition and quality of aquacultured hybrid striped bass fillets as affected by dietary fatty acids.** *Journal of Food Science* 59(1); 1994; 70-75, 90

Five groups of reciprocal cross hybrid striped bass were fed semi-purified isocaloric diets containing varying concn. of eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA). Fatty acid compositions of the edible muscle tissue generally reflected the fatty acid contents of the diets with greater concn. of DHA being accumulated compared to EPA. Sensory evaluation of cooked fish fed diets containing at least 0.50% EPA and 0.24% DHA showed a significant increase in fishy flavour intensity compared to cooked fish fed diets containing trace amounts of these n-3 fatty acids. Hybrid striped bass can be a good source of nutritional n-3 fatty acids when sufficient quantities are incorporated into their diet. AA

2218

Handumrongkul (C) and Silva (JL). **Aerobic counts, color and adenine nucleotide changes in CO_2 packed refrigerated striped bass strips.** *Journal of Food Science* 59(1); 1994; 67-69

Hybrid striped bass (HSB) strips were dipped in chlorine or distilled water and packaged in 60% CO_2, 6% O_2 and 34% N_2 (MAP) or in air. APC (aerobic plate counts) reached 10^8 cfu/g after 4 days for air and 10 days for MAP fish. Sensory panellists detected a whiter colour flesh in fish treated with chlorine. Hypoxanthine increased while IMP (inosine monophosphate) decreased and ADP and ATP did not change during storage. If inosine were excluded in the predictor, a modified K value (K^*) could be applicable as a freshness indicator of freshwater HSB but storage environment should be specified. K^* values correlated highly with APC for air (R^2 = 0.84) and MAP packs (R^2 = 0.85). AA

Carp

2219

Ushio (H) and Watabe (S). **Carp sarcoplasmic reticulum changes due to heat treatment.** *Journal of Food Science* 59(1); 1994; 80-84

Electron microscopy (EM) revealed that heat treatment in the range 35-55°C caused no observable change in membrane structures of the sarcoplasmic reticulum (SR). Proteins with mol. wt. of approx. 200 and 400 kDa, (probably dimers and tetramers of Ca^{2+}-ATPase, respectively) were observed in SDS-PAGE when the light SR was treated at 49 and 55°C, respectively. Ca^{2+} leakage from the SR was markedly enhanced with increasing temp., especially for the heavy SR. Results suggest that the decrease of Ca^{2+} uptake ability following heat treatment is at least partly caused by the acceleration of Ca^{2+} leakage together with irreversible denaturation of Ca^{2+}-ATPase protein. AA

Catfish

2220

Huang (YW), Lovell (RT) and Dunham (RA). **Carcass characteristics of channel and hybrid catfish, and quality changes during refrigerated storage.** *Journal of Food Science* 59(1); 1994; 64-66

Carcass traits of channel (*Ictalurus punctatus*) and hybrid (channel, *I. punctatus*, female x blue, *I. furcatus*, male) catfish harvested in the same pond were compared. Fillets were overwrapped or vacuum-skin packaged and stored for 13 days at 4°C. No significant differences in body wt. and proximate composition between the 2 genotypes were found. However, visceral fat of the hybrids was significantly higher than that of channel catfish. Vacuum-skin packaged fillets had significantly lower free fatty acid levels and

psychrotrophic populations than did overwrapped fillets on the 13th day of refrigerated storage. SRA

2221

Freeman (DW) and Hearnsberger (JO). **Rancidity in selected sites of frozen catfish fillets.** *Journal of Food Science* 59(1); 1994; 60-63, 84

GC volatiles and TBA values for 3 external fillet sites (lateral line, visceral-side and skin-side) and the fillet interior were compared with sensory evaluations of baked fillets to determine rancidity development. A sampling technique was developed that allowed procurement of the various fillet site tissues from whole fillets after storage at -20°C for up to 6 months. The lateral line had the most rancidity while internal tissues had the least. Instrumental examination of the lateral line proved effective for predicting sensory detection of rancidity. Correlation coeff. for lateral line total volatiles and TBA values with flavour were 0.98 and 0.95, respectively. AA

Cod

2222

Dillon (R) and Patel (T). **Effect of cold smoking and storage temperatures on *Listeria monocytogenes* in inoculated cod fillets (*Gadus morhus*).** *Food Research International* 26 (2); 1993; 97-101

In 3 trials, cod fillets [*G. morhus*] were surface inoculated with *L. monocytogenes*, cold smoked, vacuum-packaged and stored at 4°C for 3 wk or at -20°C for 3 months. Samples were removed at each stage of the smoking process and during storage, and *Listeria* were enumerated using the 3-tube MPN method. Initial inoculation concn. were 10-5 MPN/g in trial 1, 10-6 MPN/g in trial 2 and 10-1 in trial 3. Numbers of the organism remained relatively stable during the smoking process, increased with storage at 4°C, but decreased in cell number with storage at -20°C. Substantial growth occurred in trials 1 and 2, but was very slow in trial 3 where the inoculum level was low. Hence, *L. monocytogenes* contamination in smoked sea foods which are not cooked prior to consumption, may pose a health risk to the consumer. AA

Herring

2223

Hoyle (NT) and Merritt (JH). **Quality of fish protein hydrolysates from herring (*Clupea harengus*).** *Journal of Food Science* 59(1); 1994; 76-79, 129

Fish protein hydrolysates were prepared, using minced fillets and Alcalase (2.4L) and papain, from raw herring and from herring defatted by ethanol extraction, cooking and pressing. Physicochemical, sensory, storage properties and the mol. wt. sizes in spray-dried hydrolysates were evaluated. Fat extraction before hydrolysis reduced degree of hydrolysis. Alcalase hydrolysed samples to a higher degree than papain (26.8-44.7 vs. 23.8-43.1%, respectively). Ethanol extraction reduced fishy odour to barely detectable levels; enzyme type did not affect fishy odour. Papain hydrolysates were more bitter than those made with Alcalase. Hydrolysates prepared with Alcalase were darker in colour than those prepared with papain. Colour and nonenzymic browning measurements indicated darkening during 3 months storage at room temp. (approx. 20°C). AA

Mackerel

2224

Sebedio (JL), Ratnayake (WMN), Ackman (RG) and Prevost (J). **Stability of polyunsaturated omega-3 fatty acids during deep fat frying of Atlantic mackerel (*Scomber scombrus* L.).** *Food Research International* 26 (3); 1993; 163-172

Fall-caught Atlantic mackerel (*Scomber scombrus* L.) were cut transversely into steak sections and deep fat fried for 7 min in canola [rapeseed] oil at 180°C. 20 batches, each consisting of 10 randomized steak sections with approx. 12% total fat, were fried over 10 days. The longer-chain ω-3 polyunsaturated fatty acid content of mackerel was not affected by deep frying. Only small quantities of polar components, polymers and geometrical fatty acid isomers of long chain highly

polyunsaturated fatty acids were formed during deep frying. Examination of the fatty acid composition of the frying medium, fish skin and meat showed extensive lipid exchanges between the fish and the frying medium. Of the major isomers of eicosapentaenoic acid formed by thermal action 20:5Δ5c,8t,11c,14t,17c was less than 0.1% of the total 20:5 recovered from the used canola oil. AA

Salmon

2225
Reid (RA), Durance (TD), Walker (DC) and Reid (PE). **Structural and chemical changes in the muscle of chum salmon (*Oncorhynchus keta*) during spawning migration.** *Food Research International* 26 (1); 1993; 1-9

The white muscle of migrating chum salmon became increasingly soft and watery as the fish matured and progressed towards its spawning grounds. Flesh colour, measured by HunterLab parameters a and a/L, was a better indicator of maturity grade than muscle fat, protein or moisture. In the transition from grade 1 (silver-bright) to grade 4 (spawning), chum muscle protein decreased from 17.9 to 15.8%, fat decreased from 4.9 to 1.0% and moisture increased from 74.2 to 79.5%. Compositional changes and concurrent textural degradation of the flesh may be attributed to the physical stress of migration, starvation and hormonal changes during development of the reproductive system. The structural basis of the loss in protein and firm texture of chum salmon during maturation was examined, and differences between silver-bright and spawning chum muscle were elucidated by TEM and light microscopy. Light micrographs revealed an apparent loss in myofibrillar material within muscle cells as the salmon matured. With TEM, local or focal areas of degeneration were visible in both spawning and silver-bright fish, but changes were more severe in mature fish. Given a series of micrographs of muscle, judges could distinguish between the 2 groups, using a scoring system based on defined criteria of myofibril 'splitting', 'smearing', 'thinning' and 'inter-myofibril spaces'. AA

PROTEIN FOODS

Infant foods

2226
Sarwar (G), Peace (RW) and Botting (HG). **Effect of amino acid supplementation on protein quality of soy-based infant formulas fed to rats.** *Plant Foods for Human Nutrition* 43(3); 1993; 259-266

Powdered forms of soy-based infant formulas obtained from 4 manufacturers were fed to weanling rats for 2 wk as the sole source of protein in diets containing 8% protein, 20% fat and adequate amounts of minerals and vitamins. The relative PER (RPER) and the relative net protein ratio (RNPR) values (casein + methionine = 100) of diets containing unsupplemented formulas were 71-81 and 78-85, respectively. Supplementation of the formula diets with lysine (0.2%), methionine (0.2%), threonine (0.1%) or tryptophan (0.05%) increased the level of the supplemental amino acid in rat serum but generally failed to improve the RPER or RNPR values. Addition of all 4 essential amino acids to the formula diets, however, caused a marked improvement in their protein quality (RPER or RNPR values = 100). Data suggested that proteins in soy-based formulas could be marginally co-limiting in several indispensable amino acids. AA

ALCOHOLIC AND NON-ALCOHOLIC BEVERAGES

Alcoholic beverages

Wines

2227
Dussaud (A), Robillard (B), Carles (B), Duteurtre (B) and Adler (VM). **Exogenous lipids and ethanol influences on the foam behavior of sparkling base wines.** *Journal of Food Science* 59(1); 1994; 148-151, 167

The influence of added lipids (which mimic the endogeneous lipid pool of wine) on the foam behaviour of sparkling base wines at 2, 5 and

11.3% ethanol concn. was investigated by measuring the foam expansion, foam stability and the Bikerman coeff. Depending on their physical state, molecularly dissolved or aggregated, the lipids were only active at low alcohol concn. At high alcohol content foam behaviour was mainly governed by ethanol concn. Bikerman coeff. variations were correlated with surface tension variation. AA

Non-alcoholic beverages

Fruit juices

2228

Gandolfi (I), Palla (G), Marchelli (R), Dossena (A), Puelli (S), Salvadori (C). **D-Alanine in fruit juices: a molecular marker of bacterial activity, heat treatments and shelf-life.** *Journal of Food Science* 59(1); 1994; 152-154

Apple, grapefruit, orange, peach, pear, pineapple and other commerical juice samples were investigated by GC (chiral phase) and HPLC (chiral eluent) to detect D-amino acids as molecular markers of bacterial activity, heat treatments and shelf life. The development of D-amino acids was followed in grapefruit juice samples inoculated with bacteria (*Lactobacillus plantarum*) or yeasts (*Saccharomyces cerevisiae*). [D-Glutamic and D-aspartic acids were present at very low concn. (< 1 mg/l]). Significant amounts of free D-alanine [5-20 mg/l] were found only in juices affected by bacterial contamination [> 10^7 cfu/ml]. D-Alanine content was not dependent on pasteurization or sterilization treatments and did not change during the shelf life of the products. D-alanine may be considered as a marker of bacterial contamination occurring before or during juice processing. AA

Grapefruit juices

2229

Cohen (E), Birk (Y), Mannheim (CH) and Saguy (IS). **Kinetic parameter estimation for quality change during continuous thermal processing of grapefruit juice.** *Journal of Food Science* 59(1); 1994; 155-158

A method was developed to estimate simultaneously for continuous thermal process, the reaction order and Arrheneous kinetic parameters of quality changes in grape fruit juice. Simulated aseptic conditions were: 85-135°C, 40-175 s processing time and average velocities 5-30 cm/s. Quality was assessed by nonenzymic browning index (NEBI) and 5-hydroxymethyl-furfural (HMF). Average values for reaction-order and energy of activation were: 0 and 21.4 kcal/g-mol for NEBI and 0.3 and 23.2 kcal/g-mol for HMF, respectively. These values were compared with those contained in the deformed ellipsoid which define the 90% joint confidence interval of all possible parameter combinations. Based on initial and final concn., the method can predict effects of processing on liquid foods. SRA

Orange juices

2230

Rita Cava (R) and Pilar Hernandez (S). **Comparison of media for enumerating osmotolerant yeasts in orange juice concentrates.** *International Journal of Food Microbiology* 22(4); 1994; 291-295

Three methods were evaluated for their suitability to enumerate osmotolerant yeasts from 50 Venezuelan orange juice conc. Yeasts were enumerated by surface plating serially diluted samples on plate count agar containing 52% (w/w) sucrose (PCAS 52) and incubating at 32 C for 6 days; pour plating in yeast extract malt extract agar containing 52% (w/w) sucrose (YEMS 52) and incubating at 32 C for 6 days, and pour plating in potato dextrose agar (PDA), pH 3.5, and incubating at 25 C for 5 days. Mean populations of yeasts recovered were 4.2×10^5, 5.3×10^4 and 7.5×10^3 cfu/ml respectively, on PCAS 52, YEMS 52 and PDA. Significantly ($P < 0.05$) higher population were recovered on PCAS 52 than YEMS 52 and PDA. Predominant osmotolerant yeasts were *Saccharomyces bisporus* var. *mellis* (*Sacch. rouxii*). SRA

FATS AND OILS

2231

Mishra (VK), Temelli (F) and Ooraikul (B). **Extraction and purification of** ω-3 fatty acids with an emphasis on supercritical fluid extraction. A review. *Food Research International* 26 (3); 1993; 217-226

Extraction and purification of ω-3 fatty acids is reviewed. Aspects covered include: chemistry and nutritional significance of ω-3 fatty acids; sources of ω-3 fatty acids (fish oil, seed oils, algal lipids); fish oil extraction and production of ω-3 fatty acid concentrates (conventional methods of preparation, supercritical fluid extraction and fractionation of fish oils and fatty acid/esters, supercritical fluid chromatography in enrichment of ω-3 fatty acids/esters); production of biomedical test materials; and extraction of algal lipids. AA

Oils

Fish oils

2232

Abbey (M), Triantafilidis (C) and Topping (DL). **Dietary non-starch polysaccharides interact with cholesterol and fish oil in their effects on plasma lipids and hepatic lipoprotein receptor activity in rats.** *Journal of Nutrition* 123(5); 1993; 900-908

Male rats were fed the non-starch polysaccharides pectin, methylcellulose or guar gum with corn oil or with 60% of the corn oil replaced by fish oil. They were also fed these diets with or without cholesterol (+ cholic acid). Plasma total cholesterol concn. was higher overall in rats fed cholesterol and lower in those fed fish oil or fish oil + cholesterol. Plasma triacylglycerols were lower in rats fed fish with or without cholesterol. Hepatic low density lipoprotein receptor activity was higher overall in rats fed fish oil or fish oil + cholesterol than in those fed cholesterol. Liver high density lipoprotein (HDL) receptor was lower overall in rats fed fish oil or cholesterol. Type of non-starch polysaccharide influenced these dietary effects so that in cholesterol-fed rats plasma cholesterol was highest in those fed methylcellulose, intermediate in those fed guar gum and in those fed pectin was unchanged from concn. in rats fed pectin without cholesterol. Fish oil feeding lowered plasma cholesterol concn. in rats fed pectin or methylcellulose but not in those fed guar gum. Plasma triacylglycerols were lower in rats fed fish oil and all 3 non-starch polysaccharides, but concn. were similar in rats fed pectin + fish oil + cholesterol and in those fed pectin. In rats fed methylcellulose + cholesterol and any non-starch polysaccharide + fish oils, HDL receptor activity was uniformly lower than in rats fed pectin, methylcellulose or guar gum. Low density lipoprotein receptor activity was higher in rats fed pectin + fish oil or pectin + fish oil + cholesterol than in rats fed pectin. AA

Primrose oils

2233

Court (WA), Hendel (JG) and Pocs (R). **Determination of the fatty acids and oil content of evening primrose (*Oenothera biennis* L.).** *Food Research International* 26 (3); 1993; 181-186

A rapid method for analyses of oil content and individual fatty acids of evening primrose (*O. biennis* L.) is described. Oil was extracted from the seed with a Polytron probe generator using petroleum ether. A portion of the extract was concentrated to determine oil content. Results obtained with the Polytron extraction procedure were comparable to those obtained with a Soxhlet extraction procedure using the same solvent. Saponification of oil with methanolic sodium hydroxide, methylation with methanolic sulphuric acid, and extraction of esters with hexane was accomplished in a single reaction vial. Quantitation of extracted esters was carried out by capillary GC. A number of fatty acids were identified by GC-MS studies of extracted esters and methyl esters separated by their degree of unsaturation with silver nitrate-silicic acid chromatography. Saturated fatty acids from C_{12} to C_{24} were present in the oil with the even numbered acids present in the larger amounts. 8 monounsaturated fatty acids from $C_{4:1}$ to $C_{20:1}$ were identified with $C_{18:1}$ (n-9) as the major constituent of this fraction. 7 polyunsaturated fatty acids were identified with $C_{18:2}$ (n-6) and $C_{18:3}$ (n-6) as the major component. Analysis of seeds from different parts of evening primrose plants showed that differences in γ-linolenic [$C_{18:3}$ (n-6)] acid and oil content exist due to location of the seed pods. AA

SPICES AND CONDIMENTS

Spices

Pepper

2234

Hayashi (T), Todoriki (S) and Kohyama (K). **Irradiation effects on pepper starch viscosity.** *Journal of Food Science* 59(1); 1994; 118-120

Ten black (BP) and 9 white pepper (WP) samples were studied and contained 36-46 and 53-65% starch, respectively. Starch contents of pepper were not affected by irradiation. Viscosity of irradiated BP and WP decreased depending upon dosage; viscosity was not lowered by other decontamination treatments such as super-heated steam or fumigation with ethylene oxide gas. Viscosity values of unirradiated pepper varied with the lot and harvesting locality. A normalized parameter, viscosity/starch amount, of a 10% suspension of unirradiated pepper was always > 190 mPa s/g of starch and that of irradiated pepper (5 kGy) was always < 180 mPa s/g of starch, irrespective of lot and harvesting locality. SRA

SENSORY EVALUATION

2235

Giese (J). **Spices and seasoning blends: A taste for all seasons.** *Food Technology* 48(4); 1994; 88-90, 92, 94-98

This report provides information to food product developers who use and specify spices, spice blends (chilli powder, curry powder, five spice blend, pickling spice, salts) and seasonings. The various forms of spices (whole, ground or as an extractive) and the advantages of each is reviewed. Application areas of seasonings (processed and prepared meats, snacks, sauces, gravies, salad dressings, ethnic seasonings) is discussed in view of the growing popularity of reduced-fat, low calorie and ethnic foods. The antimicrobial and antioxidant properties of spices is also explored. CSA

2236

Peleg (M). **Do irregular stress-strain relationships of crunchy foods have regular periodicities?.** *Journal of Texture Studies* 24(2); 1993; 215-227

The attractors of the jagged, normalized, dimensionless, stress strain relationships of 3 dry snacks, breadsticks, pretzels and zwieback, were constructed using the Packard-Taken method. Unambiguous patterns were not revealed but the shape of the attractors differed from that of a totally random sequence. Although the existence of underlying characteristic periodicities could not be proved with the available data it could not be ruled out. BV

2237

McCarthy (KL) and Seymour (JD). **A fundamental approach for the relationship between the Bostwick measurement and Newtonian fluid viscosity.** *Journal of Texture Studies* 24(1); 1993; 1-10

The Bostwick consistometer is a durable and simple instrument used in industry to evaluate product consistency in a test involving a batch process in which a food product, such as a fruit or vegetable puree, is allowed to flow through a channel; the Bostwick measurement is the length of flow recorded in a specified time. This study evaluated the flow observed in the consistometer as a balance of forces dependent on the height of the fluid, fluid density and fluid viscosity. An expression showing the Bostwick measurement to be a function of trough geometry and fluid properties was derived. Experimental measurements for 4 Newtonian fluids (corn syrup and silicone oils of different viscosities) verified the theoretically predicted dependence of the extent of flow on kinematic viscosity to the -1/5 power. BV

FOOD STORAGE

Nil

INFESTATION CONTROL AND PESTICIDES

Nil

BIOCHEMISTRY AND NUTRITION

2238

Henley (EC) and Kuster (JM). **Protein quality evaluation by protein digestibility - corrected amino acid scoring.** *Food Technology* 48(4); 1994; 74-77

The author outlines the detn., interpretation, label application and the economic implications of protein digestibility - corrected amino acid scoring for protein quality evaluation. CSA

2239

Hallberg (L), Rossander (H-L), Brune (M) and Gleerup (A). **Inhibition of haem-iron absorption in man by calcium.** *British Journal of Nutrition* 69 (2); 1993; 533-540

The present study examines whether Ca interfered with the enhancing effect of meat on haem-Fe absorption. Inhibition was the same whether biosynthetically radio-Fe-labelled haemoglobin was given in meals with or without meat. The haem-Fe absorption ratio with:without added Ca was 0.59 (s.e. 0.07) when Ca was added to a hamburger meal and 0.52 (s.e. 0.03) when added to a wheat roll. These values were not significantly different (t 0.95; P = 0.35). The inhibition of haem-Fe absorption by Ca was, thus, a direct effect on the absorption of haem-Fe and not an indirect counteracting effect of the well-known enhancing effect of meat on haem-Fe absorption. Control studies were conducted to ensure that haem-Fe had not been degraded to non-haem-Fe during preparation of the foods. Since Ca inhibits the absorption of haem- and non-haem-Fe to the same extent, results strongly suggest that Ca interferes with the transport of Fe through the mucosal cell, and at a late stage, is common for haem- and non-haem-Fe transport. The observations that Ca strongly interferes with the absorption of both haem- and non-haem-Fe have important nutritional implications. BV

2240

Moberg (W-AC). **The effects of whole wheat, wheat bran and zinc in the diet on the absorption and accumulation of cadmium in rats.** *British Journal of Nutrition* 69 (1); 1993; 199-209

Five groups of 6 rats each were fed deionized water and 1 of 5 diets composed of 1 part basic diet and 1 part wheat crispbread for 6 wk. Accumulation of Cd in the liver and kidneys was measured using AAS and estimated by measuring the absorption and retention of -1-0-9Cd from a single meal after 3 wk on the diets. Fractional accumulation of Cd in the liver and kidneys was lower in rats fed on whole-wheat and bran diets than in those fed on wheat-endosperm diets. As adding Zn or Cd to endosperm diets to approximate the bran and whole-wheat diet levels had no effect on the fractional Cd absorption, reduced absorption from the whole-wheat and bran diets was probably not due to their higher Zn and Cd concn. but may be due to their higher fibre or phytate concn. The amount of Cd accumulated in the liver and kidneys of the rats fed on whole-wheat and bran diets was higher than that in rats fed on the endosperm diet. Thus, the reduction in the fractional Cd accumulation from the whole-wheat and bran diets is not sufficient to compensate for their higher Cd concn. AA

2241

Cunnane (SC), Ganguli (S), Menard (C), Liede (AC), Hamadeh (MJ), Zhen (Yu-C), Wolever (TMS), Jenkins (DJA). **High α-linolenic acid flaxseed (*Linum usitatissimum*): some nutritional properties in humans.** *British Journal of Nutrition* 69 (2); 1993; 443-453

Although high alpha-linolenic acid flaxseed (*L. usitatissimum*) is one of the richest dietary sources of α-linolenic acid(LA) and is also a good source of soluble fibre mucilage, it is relatively unstudied in human nutrition. Healthy female volunteers consumed 50 g ground, raw flaxseed/day for 4 wk , which provided 12-13% of energy intake (24-25 g /100 g total fat). Flaxseed raised α-LA and

long-chain n-3 fatty acids in both plasma and erythrocyte lipids, as well as raising urinary thiocyanate excretion 2.2-fold. Flaxseed also lowered serum total cholesterol by 9% and low density lipoprotein cholesterol by 18%. Changes in plasma α-LA were equivalent when 12 g α-LA/day was provided as raw flaxseed flour (50 g/day) or flaxseed oil (20 g/day) suggesting high bioavailability of α-LA from ground flaxseed. Test meals containing 50 g carbohydrate from flaxseed or 25 g flaxseed mucilage significantly decreased postprandial blood glucose responses by 27%. Malondialdehyde levels in muffins containing 15 g flaxseed oil or flour/kg were similar to those in wheat-flour muffins. Cyanogenic glycosides (linamarin, linustatin, neolinustatin) were highest in extracted flaxseed mucilage but were not detected in baked muffins containing 150 g flaxseed/kg. Results indicate that upto 50 g high-α-LA flaxseed/day is palatable, safe and may be nutritionally beneficial in humans by raising n-3 fatty acids in plasma and erythrocytes and by decreasing postprandial glucose responses. AA

2242

Kingman (SM), Walker (AF), Low (AG), Sambrook (IE), Owen (RW), Cole (TJ). **Comparative effects of four legume species on plasma lipids and faecal steroid excretion in hypercholesterolaemic pigs.** *British Journal of Nutrition* 69 (2); 1993; 409-421

The effect of 4 spp. of legume seeds on plasma cholesterol levels and faecal steroid excretion was studied in pigs. 36 growing boars were randomly allocated in groups of 6 to 6 diets which they ate continuously for 42 days. The diets fed were: a semi-purified (SP; control group 1) diet; SP + 10 g cholesterol/kg (control group 2); SP + cooked legumes (70:30, w/w; diets 3-6 contained, respectively, baked beans (*Phaseolus vulgaris*), peas (*Pisum sativum*), lentils (*Lens culinaris* Medik.), or butter beans (*P. lunatus*)) + 10 g cholesterol/kg. Fasting blood samples were taken on days 0, 14, 28 and 42 for the detn. of total plasma cholesterol, high-density-lipoprotein (HDL)-cholesterol and triacylglycerols. After 42 days total cholesterol and HDL-cholesterol levels were raised significantly in all groups, but to different extents. In comparison with control group 2, diet-induced hypercholesterolaemia was significantly inhibited in groups consuming baked beans, peas and butter beans, although HDL-cholesterol levels were maintained. Faecal steroid excretion by the legume groups was not significantly different from that of control group 2. Results suggest that the mechanism for the hypocholesterolaemic effect does not involve increased hepatic bile acid synthesis and thereby increased cholesterol clearance via the intestinal route. AA

2243

Thompson (LU). **Potential health benefits and problems associated with antinutrients in foods.** *Food Research International* 26 (2); 1993; 131-149

Problems and benefits associated with the presence of antinutritional factors in foods are reviewed, with respect to their role in health and disease. Aspects considered include: The problems (phytic acid, protease inhibitors, phytoestrogens and lignans, saponins, phenolic compounds, amylase inhibitors, lectins or haemagglutinins); and The health benefits (lower blood glucose and hormonal responses [phytic acid (PA), lectins, phenolics and amylase inhibitors], reduction of blood lipids [saponins, PA, amylase inhibitors, phenolics, phytoestrogens and lignans], reduction in cancer risk [PA, protease inhibitors, phytoestrogens and lignans, saponins, phenolic compounds], and other benefits). Many references. BV

2244

Stahl (W), Schwarz (W) and Sies (H). **Human serum concentrations of all-trans β- and α-carotene but not 9-cis β-carotene increase upon ingestion of a natural isomer mixture obtained from *Dunaliella salina* (Betatene).** *Journal of Nutrition* 123(5); 1993; 847-851

The uptake of all-trans and 9-cis β-carotene and of α-carotene from a natural carotene preparation from *Dunaliella salina*, Betatene, was studied in humans. All-trans β-carotene and α-carotene were absorbed well and showed the expected biokinetics, with serum peak concn. between 24 and 48 h. The mean increase in serum concn. of α-carotene was 5.6% of the increase of all-trans β-carotene,

reflecting the composition of these carotenoids in Betatene. 9-cis β-Carotene, however, was not detected in human serum, even after repeated doses. This could be due to preferential absorption of all-trans β-carotene, rapid distribution of 9-cis β-carotene into the tissue, or the presence of isomerase activity processing 9-cis to all-trans β-carotene. AA

2245

Kim (M) and Atallah (MT). **Intestinal solubility and absorption of ferrous iron in growing rats are affected by different dietary pectins.** *Journal of Nutrition* 123(1); 1993; 117-124

The effects of pectin structure on Fe solubility were examined *in vivo* and *in vitro* using pectins differing in degree of esterification (DE) and mol. wt. (MW). The pectins prepared differed (in DE and MW, respectively) as follows: P-A (pectin A) (73%, 860 000), P-B (75%, 89 000), P-C (22%, 1 260 000) and P-D (24%, 114 000). Weanling rats were trained to consume a basal diet containing $FeSO_4$ as the Fe source within 2 h. Food-deprived rats were presented the basal diet or the same diet containing 1 of the pectins at 80 g/kg diet. 1 h after the meal, soluble, insoluble and tissue Fe in intestinal segments and serum Fe concn. in portal blood were determined and amounts of absorbed Fe were calculated. Portal blood Fe and calculated absorbed Fe were highly correlated ($r = 0.97$). None of the pectins reduced Fe solubility or absorption below that in rats fed the basal diet. Addition of P-B increased the amount of Fe absorbed and postprandial serum Fe concn. in portal blood. Solubility of $FeSO_4$ in vitro was higher in solutions containing pectins than in a cornstarch solution ($P < 0.05$) and was also higher in diets containing pectin than in the basal diet ($P < 0.05$). The pectin with the high DE and low MW (P-B) improved Fe solubility and absorption of solubilized Fe. AA

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